**DEPARTMENT OF BUILDING**

**UNIVERSITI TEKNOLOGI MARA**

**(PERAK)**

# CONSTRUCTION OF STANDARD PIER

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**DECEMBER 2018**

It is recommended that the report of this practicsl provied

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**Entitled**

**CONSTRUCTION OF STANDARD PIER**

Be accepted in partial fulfilment of the requirement for obtaining the Diploma In Building.

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**DEPARTMENT OF BUILDING**
**FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING**
**UNIVERISITI TEKNOLOGI MARA**
**(PERAK)**

**3 SEPTEMBER – 7 DECEMBER 2018**

## 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 WCT Sdn Bhd for duration of 14 weeks starting from 3rd September 2018 and ended on 7th December 2018. It is submitted as one of the prerequisite requirements of DBG307 and accepted as a partial fulfilment of the requirements for obtaining the Diploma in Building.

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Date : 15th December 2018

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On top of that, I would like to express my gratitude to all of the UiTM lecturers that have taught and nurtured me in becoming a better student and person. I would also like to extend my deepest appreciation to the lecturers who are directly involved during my training stint. Moreover, I would like to thank to Cik Azizah bt Talkis, Supervising Lecturer, Pn Noor Sahidah bt Samsudin, Visiting Lecturer, En. Muhammad Naim Bin Mahyuddin, Practical Training Coordinator and Dr. Dzulkarnaen Bin Ismail, Programme Coordinator. I appreciate and value all the time, effort, encouragement and ideas that they have contributed towards the successful completion of my training, this report and the valuable knowledge that have been shared over the last few semesters.

Last but not least, my special thanks to my beloved parents for their sacrifices over the years and my dear friends.

Thank you so much

## ABSTRACT

Industrial training is an important phase of a student life. A well planned, properly executed and evaluated industrial training helps a lot in developing a professional attitude. It develops an awareness of industrial approach to problem solving, based on a broad understanding of process and mode of operation of organization. The aim and motivation of this industrial training is to receive discipline, skills, teamwork and technical knowledge through a proper training environment, which will help me, as a student in the field of Information Technology, to develop a responsiveness of the self-disciplinary nature of problems in information and communication technology.

As a part of the curriculum, and for the partial fulfilment of the requirements for completion of the Diploma in Building from UiTM Seri Iskandar, Perak, underwent an industrial training at the WCT Berhad for KVMRT Package V204 for 12 weeks during the months 3rd September 2018 and ended on 7th December 2018The report consists of brief study and description of materials, Equipments and procedures used at the site for construction. The report contains Three chapters in which I try to explain my 12 weeks experience in the hosting company. The content of all chapters is broadly explained and it is constructed from the practical basis of the site works ended all months. In the opening chapter I give details to the company background including its mission. It gives the details of the company in terms of reader can easily know and access the company. The second chapter is the most hunted chapter which explains my overall internship familiarity in the last successive months. This chapter is the main chapter and I record on it the overall works have been executing.

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# CHAPTER 1.0

# INTRODUCTION

## 1.1 Background and Scope of Study.

A pier foundation is a collection of large diameter cylindrical columns to support the superstructure and transfer large super-imposed loads to the firm strata below. It stood several feet above the ground which is also known as "post and beam". In a simpler form for KVMRT Project, the post will be the pier and the beam will be the MRT Station.

There are normally two types of pier foundation which are the masonry or concrete pier and drilled caissons. The first one is depending on the level of the stratum as if it has a good bearing stratum up to 5m, the masonry piers are used. The size and shape of the piers also affected by the nature of the soil and depth of bed. The latter usually refer to the cylindrical foundation largely a compressed member that subjected to an axial load at the top and reaction at the bottom.

Pier provide vertical support for spans at intermediate points and perform two main functions which are transferring superstructure vertical loads to the foundations and resisting horizontal forces acting on the bridge. Although piers are traditionally designed to resist high lateral loads caused by seismic events. Even in some low seismic areas, designers are paying more attention to the ductility aspect of the design. Piers are predominantly constructed using reinforced concrete. Steel, to a lesser degree, is also used for piers. Steel tubes filled with concrete (composite) columns have gained more attention recently (Lian Duan 1999)

Piling made of concrete offer many advantages. Its one big benefit is that the do not cost a lot and that is important to every project. In fact, piers manufactured from concrete are far less expensive to make than piers made of steel. On top of that, it has wide range of variety when it comes to design with not a complex method and require less amount of materials and labour as the materials are easily available. Furthermore, it causes minimal disruption to the soil environment making the site environment is easy to keep its natural state and condition.

Pile and pier are both deep foundation. Pile foundation is a type of deep foundation, in which the loads are taken to a low level by means of vertical timber, concrete or steel whereas pier foundation is a type of deep foundation, which consists of a column of large diameter to support and transfer large superimposed loads to firm strata below.

The most common pier types are solid shaft pier, column pier, cantilever or hammerhead pier, column bent and pile bent. Solid shaft piers are used when a large mass is advantages or when a limited number of load points are required for the superstructure. Next, column piers are used when Cantilever or hammerhead pier is the pier being narrow clearance is applicable under the structure or when narrow superstructure widths are required. The cantilever or hammerhead pier is modified column for use with multi-beam superstructure. Moreover, the column bent is a common pier type for highway grade crossings. Lastly, pile bent may be constructed of concrete, steel or timber. Typically they are driven in place and support a cast-in-place concrete cap.

There are quite numerous number of pier available but the ambition is to discover and determine the construction of the hammerhead pier at the KVMRT Project Package V204 from Bandar Malaysia South to Kampung Muhibbah.
This inquiry focuses on the construction of the cantilever or hammerhead pier at KVMRT Package V204 mainly in Kuchai Lama and Kampung Malaysia Station. The study is carried out from 3rd September 2018 until 7th December 2018 perceived by the WCT Company staff and workers.

### 1.1.1 Kuchai Lama


**Figure 1.1: The map of Kuchai Lama**

### 1.1.2 Kampung Malaysia


**Figure1.2: The map of Kampung Malaysia**

## 1.2 Objectives

**1.2.1 To study the methods of installation of the standard pier including the machineries and equipment used in the construction site.**

**1.2.2 To examine the defects on concrete and how to overcome them during the construction.**

**1.2.3 To aware the environmental impacts depending on the type of activity and its operational control measures.**

## 1.3 Methods of Study

1. **Observation**

   Work selected for method study can be identify as opportunity through monitoring and supervising while collecting data from the field by personally going to the field. I have been observed the construction of pier for 3 months. During observing, information and instruction were given to the workers and it makes me a participant observer. The observation was takes place in accordance to pre-planning plans with experimental procedure and good condition of plant and equipment as well as the correct sequence method of constructing the pier. It is a controlled observation generally done at the site I studied. Besides, observation also being done to the condition of the concrete during post inspection and the environment of the site.

2. **Interview**

   This method of collecting data involves oral-verbal stimuli and reply in terms of oral-verbal responses where interviewer asks questions which are aimed to gain information for study to respondent who is the person in charge at site.

   The person that I interviewed with is the more than 10 years' experience, the Site Coordinator of Kampung Malaysia at site under his supervision I had the freedom to ask and add question in good manners about the deep knowledge and skill required.

   For the structured interviews, a set of predetermined questions are assemble. The person that I interviewed with is an talented and young Senior Engineer. Some of the questions are the importance of pier, the differences between pier and pile and many more.

3. **Document Review**

   The construction drawing, rebar drawing and some pictures are the document that I asked from the sub-contractors BCSC workers to accomplish this study.

# CHAPTER 2.0

# COMPANY BACKGROUND

## 2.1 Introduction of Company

The WCT story began on 14 January 1981 with the incorporation of WCT Earthworks & Building Contractors Sdn Bhd, a humble one-machine company specialising in earthworks. After many years of industry experience, the company successfully established a stronger presence and a solid reputation. Following this, the company was listed on Bursa Malaysia in 1995.

As WCT continued to grow in prominence, the company successfully reorganised its corporate structure on 8 July 2013 under a listed investment holding company called WCT Holdings Berhad (WCT). Under the new structure, WCT operates through two subsidiaries – WCT Berhad and WCT Land Sdn Bhd, which are primarily involved in engineering and construction, property development and investment & management activities.

Over the years, WCT has evolved into a global brand known for its reliability and trustworthiness. Its ability to deliver first class products and services has transformed WCT into a well-known industry heavyweight. With a workforce of over 2,000 dedicated personnel and a large fleet of plant and machinery, the company's global presence can be felt in Malaysia, Qatar, UAE, Bahrain, India and Vietnam. WCT Berhad is the Engineering and Construction Division of WCT Holdings Berhad. Specialising in earthworks, highway construction, engineering, buildings and related infrastructure works, the company also provides management services.

Our industry expertise has led to various large-scale constructions of F1 racing circuits, airports, dams and water supply schemes, expressways and highways, civil works, interior fit-out works and monumental buildings such as shopping complexes and government administrative centres.

## 2.2 Company Profile

### 2.2.1 The Philosophy


**Figure 2.1: The Logo of WCT Sdn Bhd**

The name of WCT itself has its own meaning which is **W**ining through **C**ommitment and **T**eamowrk built upon the foundation of humility and respect.

### 2.2.2 The Vision and Mission

The Vision of WCT Holdings Berhad.

**"We inspire and strive for excellence in area of our expertise"**

The Mission of WCT Holdings Berhad.

We deliver quality products and services beyond customer expectations. Our approach is to develop, train and reward passionate and committed employees. We leverage on technology and innovation for greater efficiency and productivity. We deliver sustainable returns to our shareholders. We contribute to the betterment of the community. We actively participate in the nation's social and economic objectives.

At WCT, our beliefs are built upon our 5 core values which are WINNING exceeding our best, COMMITMENT passionate in all we do, TEAMWORK all for one, one for all, HUMILITY and RESPECT our way of life.

Once again, a strong emphasis is placed within the company to nurture these values, and as trainees, this values and their importance was a recurring theme in out induction. Even at general staff meetings, examples of people acting out these values were presented and applauded. This great value orientation in WCT is I believe one of their greatest strengths and something that should be continued and encouraged.

### 2.2.3 The Awards and Achievements

**Figure 2.2: WCT has garnered much praise and several awards as a testament to our commitment over the past years.**

2.2.3.1 Industry Awards

Malaysian Construction Industry Excellence Awards by Construction Industry Development Board (CIDB)

- Builder of the Year Award – 2018 & 2002
  WCT Berhad
- International Achievement Award
  Ministry of Interior (MOI), Qatar – 2018
  Yas Marina Circuit, U.A.E – 2010
  Bahrain International Circuit, Bahrain – 2004
- Green Building Award – 2018
  Ministry of International Trade and Industry (MITI) Headquarters, Kuala Lumpur, Malaysia
- Contractor of the Year Award – 2010
  Kota Kinabalu International Airport, Sabah, Malaysia
- Special Project Award – 2001
  Sepang F1 Circuit, Selangor, Malaysia

2.2.3.2 Corporate Awards

1. Malaysia Best Employer Brand Awards

Best Employer Brand Award – 2018
New World Petaling Jaya Hotel, Paradigm Petaling Jaya, Selangor, Malaysia

2. Leadership in Energy & Environmental Design (LEED) Certification

Silver Certification under LEED 2009 Core and Shell Development – 2017
gateway@klia2 Shopping Mall, Sepang, Selangor, Malaysia

3. Green Building Index (GBI)

Gold Award -Ministry of International Trade & Industry, Malaysia (MITI) Headquarters, Kuala Lumpur, Malaysia
Silver Award -Lot 2C5, Putrajaya, Malaysia
Gold Award for Excellent Health, Safety & Environment Management System – 2013
Silver Award for Effective Health, Safety & Environment Management System – 2011
WCT Berhad

### 2.2.4 The Corporate Information

WCT Holdings Berhad Head Office, Malaysia

- Adress :

  B-30-01

  The Ascent, Paradigm

  No. 1, Jalan SS7/26A, Kelana Jaya

  47301 Petaling Jaya

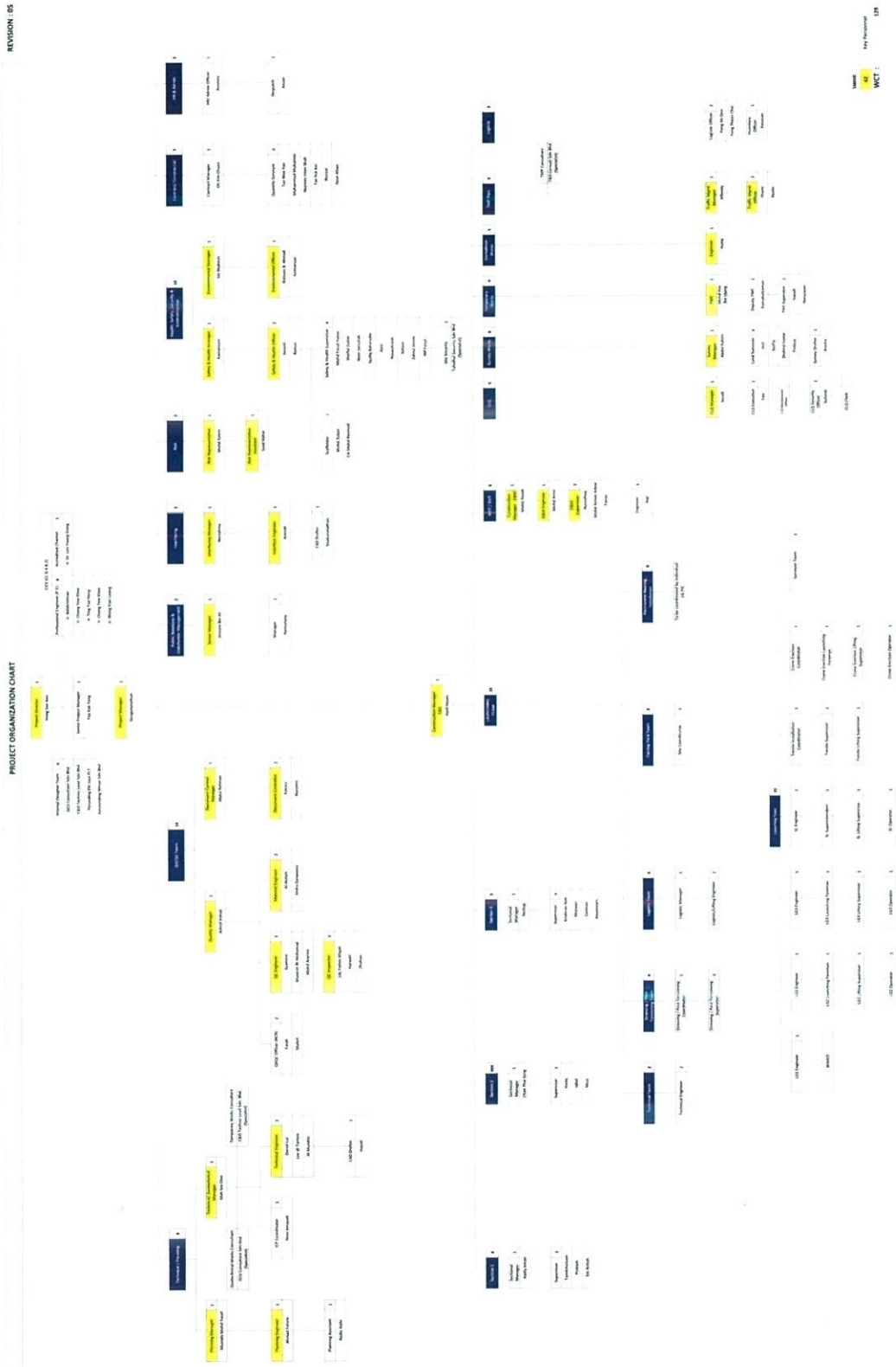
  Selangor Darul Ehsan, Malaysia

- Tel:
- Fax:
- Email: enquiries@wct.my
- Brands :

  1. Luxury Homes and High-Rise Residences

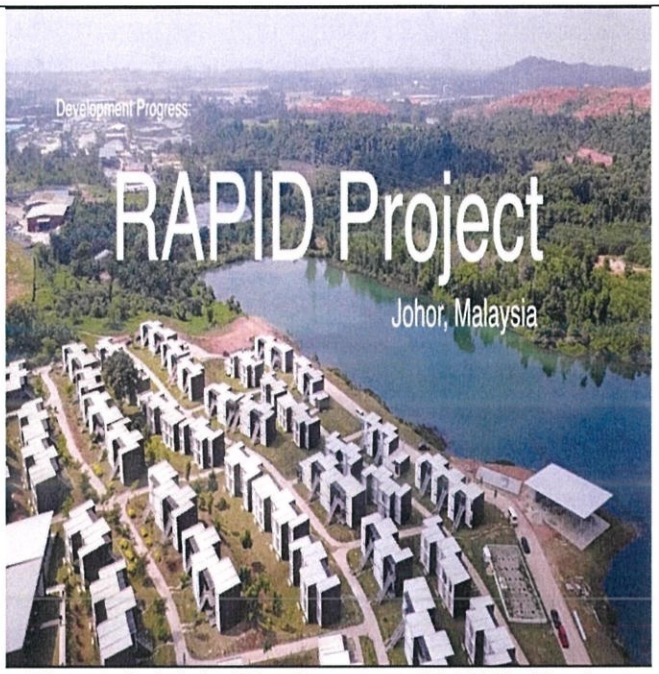

  2. Integrated Commercial Developments, Shopping Malls and Hotel

## 2.3 Organization Chart



## 2.4 List of Project

### 2.4.1 Completed Projects

| | | |
|---|---|---|
| 1. | **Petronas RAPID Pengerang Site, Johor, Malaysia**<br><br>On 18 July 2014, WCT was awarded the RM341.9 million contract from Petronas Refinery and Petrochemical Corporation Sdn Bhd to undertake the construction of access and permanent roads within the RAPID site at Pengerang, Johor.<br><br>On 26 October 2015, PRPC Utilities and Facilities Sdn. Bhd., a subsidiary of Petroliam Nasional Berhad ("PETRONAS") Group, awarded WCT with a RM267million contract. |  <br>**Figure 2.4.1.1: The Petronas RAPID Project** |
| 2. | MyTOWN Shopping Centre, Jalan Cochrane, Malaysia.<br><br>WCT was awarded a RM651.6 million contract by Boustead Ikano Sdn Bhd to undertake the construction of a proposed shopping centre along Jalan Cochrane, Kuala Lumpur. |  <br>**Figure 2.4.1.2: The MyTOWN** |
| 3. | Ministry of International Trade and Industry, Kuala Lumpur, Malaysia<br><br>In early 2012, WCT secured a RM300 million contract to design and build the headquarters of the Ministry of International Trade and Industry (MITI) on Jalan Khidmat Usaha, Kuala Lumpur. |  <br>**Figure 2.4.1.3 : The MITI** |

| | | |
|---|---|---|
| 4. | Paradigm Mall Johor Bahru, Johor, Malaysia<br><br>Paradigm Mall Johor Bahru opened its doors on 28 November 2017. The mall is developed by WCT Hartanah Jaya Sdn Bhd, a subsidiary of WCT Holdings Berhad. Located at Jalan Skudai, |  <br>**Figure 2.4.1.4: The JB Paradigm Mall** |
| 5. | Première Hotel, Klang, Selangor, Malaysia<br><br>Première Hotel marks WCT Group's first foray into the hospitality business. Launched in October 2010, the hotel features 250-room and suites, 3 Executive Club floors, and is located within the vibrant township of Bukit Tinggi. Ranked number one in Klang by TripAdvisor |  <br>**Figure 2.4.1.5: The Klang Première Hotel** |
| 6. | The Ascent, Paradigm Petaling Jaya, Selangor, Malaysia (Leasing)<br><br>The Ascent at Paradigm Petaling Jaya is a modern and prime Class A corporate office tower erected in a strategic and coveted location in Petaling Jaya. With a total net lettable area of 520,000 sq ft., it comprises 32-storey corporate office tower including a MSC Status Accredited Incubator, the Ascent Incubation Centre (AIC) |  <br>**Figure 2.4.1.6: The Ascent Paradigm Mall** |

### 2.4.2 Project in Progress

| | | |
|---|---|---|
| 1. | **MRT2 V204 & S204 - Bandar Malaysia South Portal to Kampung Muhibbah**<br><br>On 14 November 2016, WCT accepted an RM896.41 million contract from Mass Rapid Transit Corporation Sdn Bhd to undertake and complete the Work Package V204 for the construction and completion of viaduct guideway and other associated works from Bandar Malaysia South Portal to Kampung Muhibbah. |  <br>**Figure 2.4.2.1: The MRT2 Site** |
| 2. | **Tun Razak Exchange (TRX), Kuala Lumpur, Malaysia)**<br><br>Commercial Mixed Development Works at Jalan Tun Razak<br><br>On 14th September 2018, WCT executed a Trade Contract to undertake a RM555.0 million Proposed Commercial Mixed Development |  <br>**Figure 2.4.2.2: The TRX future view** |
| 3. | **Pavilion Damansara Heights (Parcel 1), Pusat Bandar Damansara, Mukim Kuala Lumpur, Malaysia**<br><br>Commercial Development at Lot 54325 Jalan Damanlela<br><br>On 14th September 2018, WCT Berhad secured a contract worth RM1.77 billion from Impian Ekspresi Sdn Bhd for the construction and completion of Pavilion Damansara Heights (Parcel 1) commercial development project. |  <br><br>**Figure 2.4.2.3: The Damansara Heights future view** |

# CHAPTER 3.0

# CASE STUDY

## 3.1 Introduction to Case Study

The MRT project was made an Entry Point Project of the Economic Transformation Programme (ETP) under the Greater Kuala Lumpur/Klang Valley National Key Economic Area (NKEA). The ETP is being implemented by the The Performance Management and Delivery Unit (Pemandu) of the Prime Minister's Department.

The SSP Line will be the second MRT line to be developed. The line will serve a corridor with a population of around 3 million people stretching from Sungai Buloh to Putrajaya and will include Sri Damansara, Kepong, Batu, Jalan Sultan Azlan Shah, Jalan Tun Razak, KLCC, Tun Razak Exchange, Kuchai Lama, Seri Kembangan and Cyberjaya.

The alignment will have a length of 52.2km consisting of 38.7km of elevated tracks and 13.5km running through underground tunnels. It will have 35 stations of which 24 are elevated and 11 underground.

At commencement of full service in the second quarter of 2022 which roughly around April to Jun of 2002, the SSP Line is expected to have a ridership of 529,000 passengers per day. This is expected to further improve the chronic traffic congestion currently faced by Kuala Lumpur.

There will be 11 interchange stations making it much easier for commuters to transfer from the SSP Line to existing and future rail lines including the future Kuala Lumpur-Singapore High Speed Rail. Sixteen stations will have park and ride facilities.

The Government gave its approval for the implementation of the SSP Line in 2014. A Public Inspection exercise pursuant to Section 84 of the land Public Transport Act 2010 was then held from May to August 2015 for members of the public to give their feedback and objections.

The progress of overall project is 38.6% as at 30$^{th}$ November 2018.

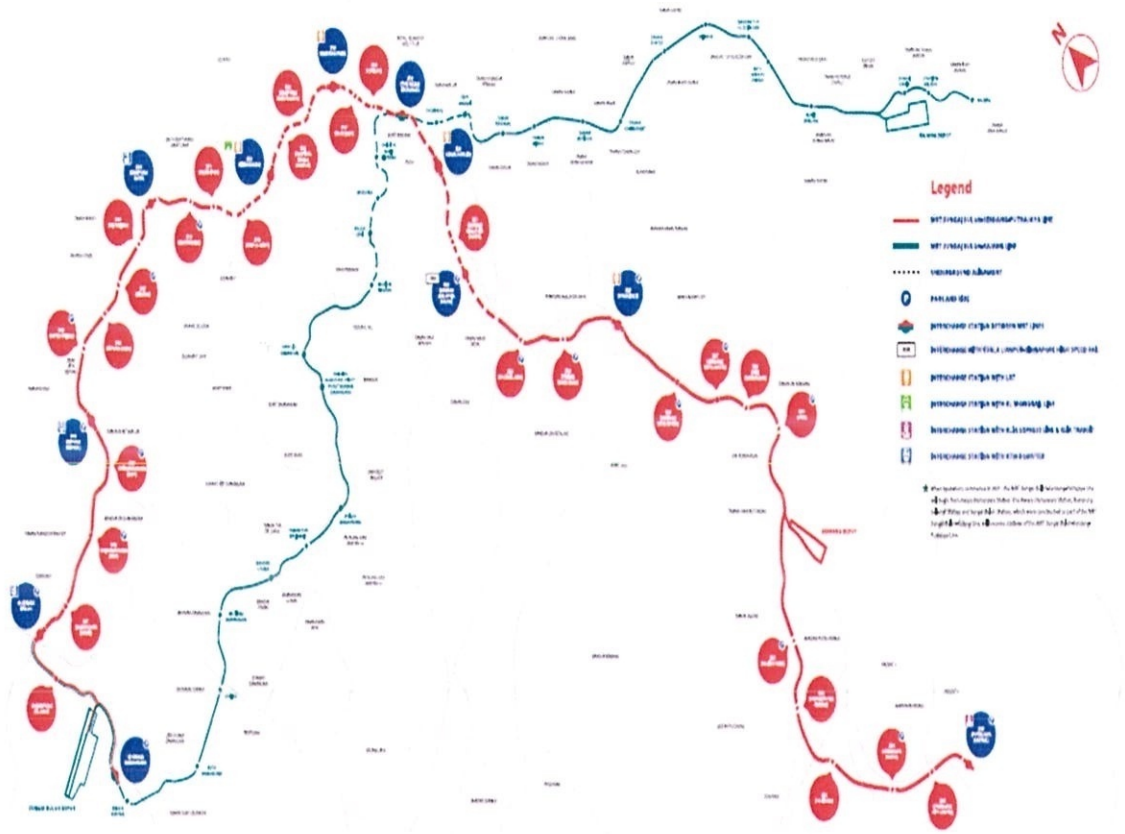



**Figure 3.1.1: The flow of the SSP Line 2 of KVMRT Project.**

The proposed design for Sungai Buloh-Serdang-Putrajaya (SSP) Line elevated stations is based on the "Serambi" concept.

This concept is focused on inspiring interaction/ communication at a foyer/ entrance space of a house, hall,.i.e. entrance space at a "rumah kampung" or "rumah panjang".The design opted is a simple. timeless design: which is derived from various design concepts, including that of the Japanese "Zen" concept.Other aspects include open space, natural lighting & ventilation, and natural visual effects via play of lighting & shadows.

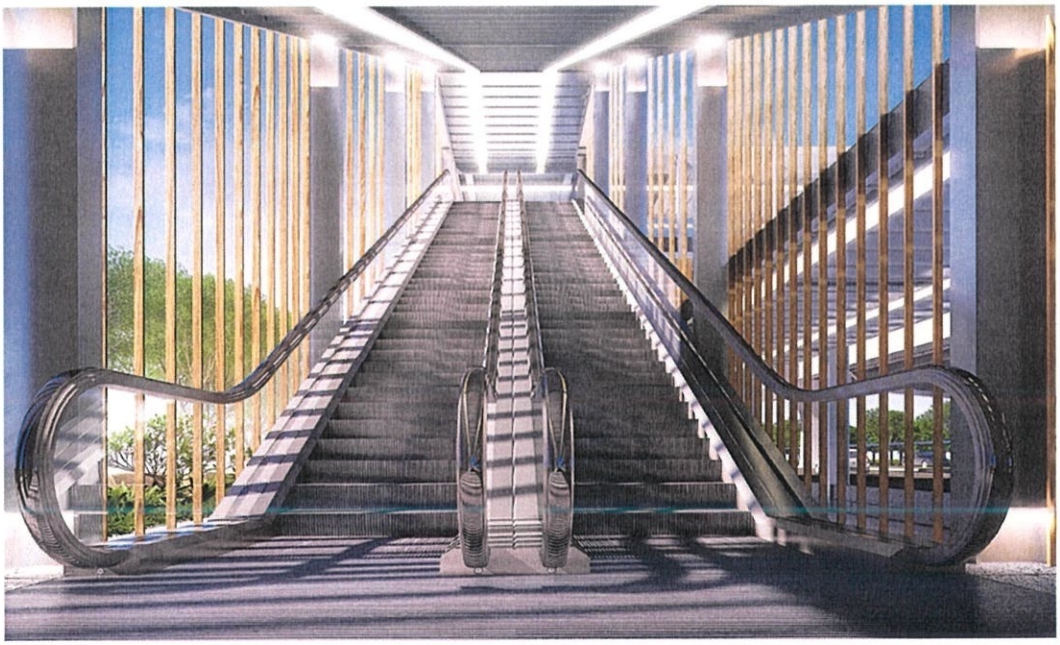


**Figure 3.1.2: The elevated drawing of the view inside the station.**

The proposed design for Sungai Buloh-Serdang-Putrajaya (SSP) Line elevated stations is based on the "Serambi" concept. This concept is focused on inspiring interaction/ communication at a foyer/ entrance space of a house, hall,.i.e. entrance space at a "rumah kampung" or "rumah panjang".

The design opted is a simple. timeless design: which is derived from various design concepts, including that of the Japanese "Zen" concept.

On 14 November 2016, WCT won RM896.41 million contract from Mass Rapid Transit Corporation Sdn Bhd to undertake and complete the Work Package V204 for the construction and completion of viaduct guideway and other associated works from Bandar Malaysia South Portal to Kampung Muhibbah.

The scope of work of this MRT project covers soil investigation, traffic management and diversion, safety, health and environmental management, site clearance, demolition and earthworks, ground treatment, protection & relocation of utilities, viaducts and underpass & approach tunnel, drainage works, roadworks and road furniture, street lighting and traffic light system, landscaping works, E&M works, external works to stations and ancillary works and miscellaneous structures.

Subsequently on 19th September 2017, WCT was awarded a RM199.5 million contract to undertake and complete Package S204 for the construction and completion of elevated stations and other associated works at Kuchai Lama and Taman Naga Emas.

Our site project have 6 locations which are Bandar Malaysia South, Kuchai Lama, Jalan 34, Taman Naga Emas, Kampung Malaysia and Kampung Muhibbah. All of the site locations are divided into three section. The Section 1 is Bandar Malaysia South and Kuchai Lama. Next, jalan 34 and Taman Naga Emas are Section 2. Last is the Section 3 which are Kampung Malaysia and Kampung Muhibbah. The surrounding for all of this location are differ according to where they location located.

The surrounding of Kuchai Lama, Section 1 is quite busy because it is just along the main road and very urbanise as it has the main branch of Ajinomoto Malaysia factory, flyovers and on-going construction condominium just a stone throw away from the Kuchai Lama site location. The landscape of Taman Naga Emas is quite hilly and pack with building. There is an apartment and school at this area. Lastly, the Section 3 surrounding area is very hectic because it is located beside the Besraya Highway.

The activities that being carried out at site are bore piling, excavation, concreting

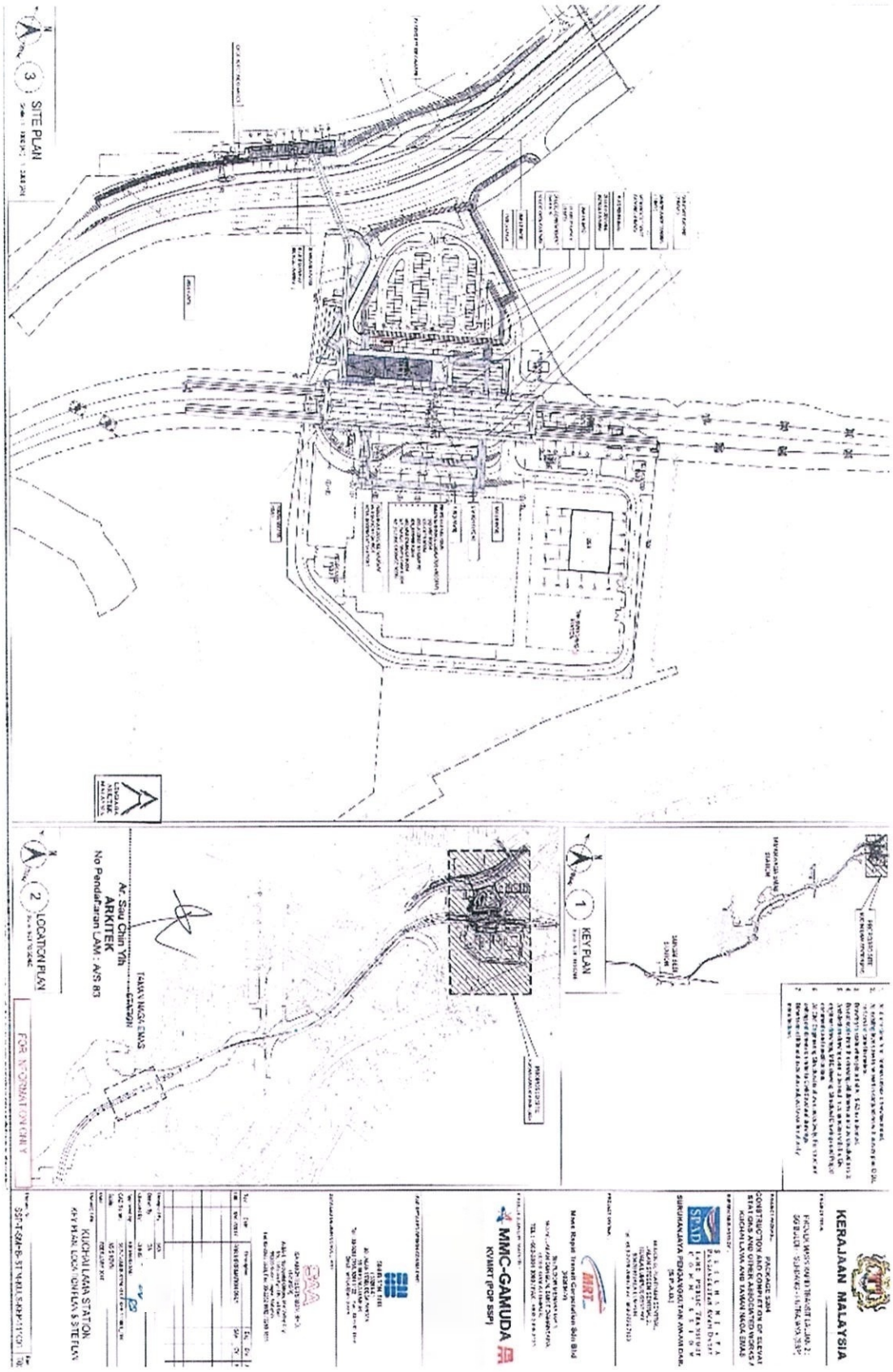



**Figure 3.1.3: The key plan, location plan and the site plan of Kuchai Lama**

## 3.2 The methods of installation of the standard pier including the machineries and equipment used in the construction site.

The construction method for constructing the pier foundation is important in this project as foundation is a collection of large diameter cylindrical columns to support the superstructure and transfer large super-imposed loads to the firm strata below. It stood several feet above the ground and also known as "post foundation". The technique is easy and the materials required is easily available. On top of that, it is necessary to acknowledge all the machineries and equipment that have been used to construct the pier.

This method briefly describes the construction of pier reinforcement working & access platform. Pier formwork design for all related pier construction (pier base to pier cap) shall be submitted separately and approved by PDP/SC. The design shall be endorsed by Professional Engineer, PE. After the piling works and concreting pile cap had been done. The surface of the pile cap was cleaned of any laitance, oil, debris mud and many else as the preparation work for the first lift.


**Figure 3.2.1: The pile cap was brush off any unwanted excess**

Next, four corners of column were marked to position and as-built the pile cap.

After the displacement of sheet pile, the area was backfilled until the same level as pile cap.

**Figure 3.2.2 The backfilling of pile cap**

Then, the reinforcement working platform was installed to be used for all pier columns. The design calculation & shop drawings shall be submitted separately for PDP's approval prior to work.


**Figure 3.2.3: The installation of working platform**

The reinforcement bars which are the starter bar and links were installed and lapped at locations where the starter bars for pier were installed earlier in the pile cap. The numbers, sizes and lengths and positions of all reinforcing bars, links, stirrups, spacer bars and other parts other steel reinforcement were installed in accordance with the IFC/Construction Drawings and specifications.


**Figure 3.2.4: The installation of reinforcement bar at pile cap**

The lapping and anchorage length is in accordance with Line Wide Viaduct General Notes Sheet 1 (SSP-W-HTCE-GENE-OVPR-CNS-GEN-000200).

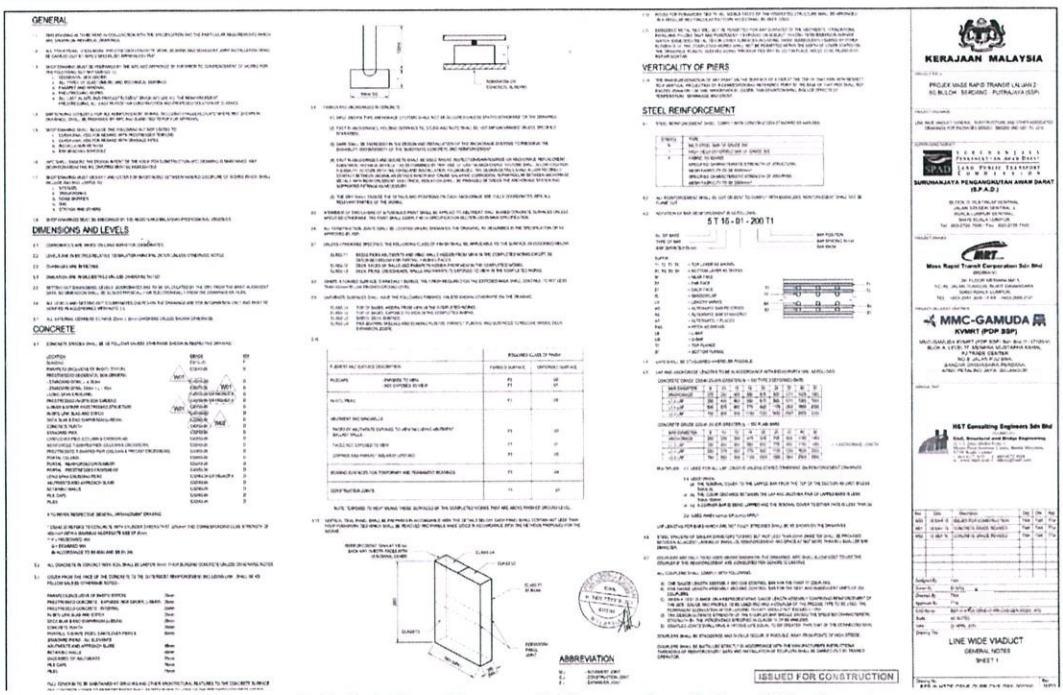



**Figure 3.2.5: The General Notes for Line Viaduct**

After that, all the reinforcement bar was checked to ensure the dimension and position in placed. Joint survey with Site Consultant were taking part to ensure starter bars positions are correct.


**Figure 3.2.6: The Inspection of links and starter bar done by Encik Hafiz, The Site Coordinator**

All pipes and fittings Rainwater Downpipe (RWDP) and Earthling pipe were installed according to IFC or Construction drawing prior to the installation of pier formwork.

**Figure 3.2.7: The installation of pipes by subcon Edlamb**

Then, the spacer block was adequately secured to the reinforcement bar.

**Figure 3.2.8: The installation of spacer block**

Upon completion of reinforcement bar installation, a joint inspection were carried out with SC to ensure reinforcement bars are installed according the IFC/construction drawing as well as the accordance of spacer block.

**Figure 3.2.9: The inspection being done by surveyor and approved by SC.**

All formwork were applied with mould oil. This is to ensure a smooth and nice surface of concrete and have a mould without any excess of concrete left at the surface of it after done removal.

**Figure 3.2.10: The applicable of mould oil**

Upon acceptance of the reinforcement bar installation by Supervising Consultant, the formwork installation works were commenced. The mould were placed one by one by using bolt and nut. Tie rod also was fixed into the mould to prevent the mould from broke. It is also to prevent seepage and bleeding during concreting. The turn buckle was used to align the first lift mould cast inly after the pile cap. This is to ensure the pier will not be inclined during concreting.

**Figure 3.2.11: The installation of first lift mould**

Joint survey for the column formwork as-built at the 4 corners were carried out. When necessary, chain block might be used for minor or fine tuning of mould alignment.

**Figure 3.2.12: The inspection of the formwork**

Prior to concrete placement, concrete slump was carried out within tolerance of allowable concrete temperature at sampling point from the mixer truck. The concrete needs to satisfy all the requirements before it discharged into formwork

**Figures 3.2.13: Slump Test**

With the aid of the mobile crane, concrete was discharged from the concrete truck into the pier forms by using a small size concrete bucket and a 600mm x 600mm hopper connecting with a 200mm diameter tremie pipe(@ 4m and 2m length).

**Figure 3.2.14: The step by step of concreting works**

The concrete was properly vibrated using 6m hose mechanical vibrator (tube length 500mm, diameter 50mm & 75mm). During placing of concrete, avoid or reduce the vibrator poker / tremie pipes from hitting the reinforcement bars to ensure that it would not be displaced.

**Figure 3.2.15: The vibration works**

Using mobile crane, hook the chain sling to the lifting point provided at the formwork for formwork removal.

**Figures 3.2.16: The step by step of formwork removal.**

Upon removal of the formwork, curing was applied to exposed surfaces by spraying curing compound onto the entire exposed concrete surface.

**Figures 3.2.17: The curing process.**

Prior to removal of the formwork, the minimum periods before removing formwork to structural members were established in accordance with BS 8110: Part 1.

| Type of framework | Minimum period before striking | |
|---|---|---|
| | Surface temperature of concrete | |
| | 16 °C and above | $t$ °C (any temperature between 0 °C and 16 °C) |
| Vertical formwork to columns, walls and large beams | 12 h | $\frac{300}{t+10}$ h |
| Soffit formwork to slabs | 4 days | $\frac{100}{t+10}$ days |
| Soffitt formwork to beams and props to slabs | 10 days | $\frac{250}{t+10}$ days |
| Props to beams | 14 days | $\frac{360}{t+10}$ days |
| NOTE This table can be applied to PC and SRPC of higher cement strength classes. | | |

**Table 3.2 Minimum period before striking formwork**

After removal of the formwork, each column shall be identified by the WPC for its size, shape, lines, dimensions, alignment, location, level and vertically. In case there are any defects shall be identified and recorded. Remedial measures shall be proposed and agreed by the consultants prior to implementation.

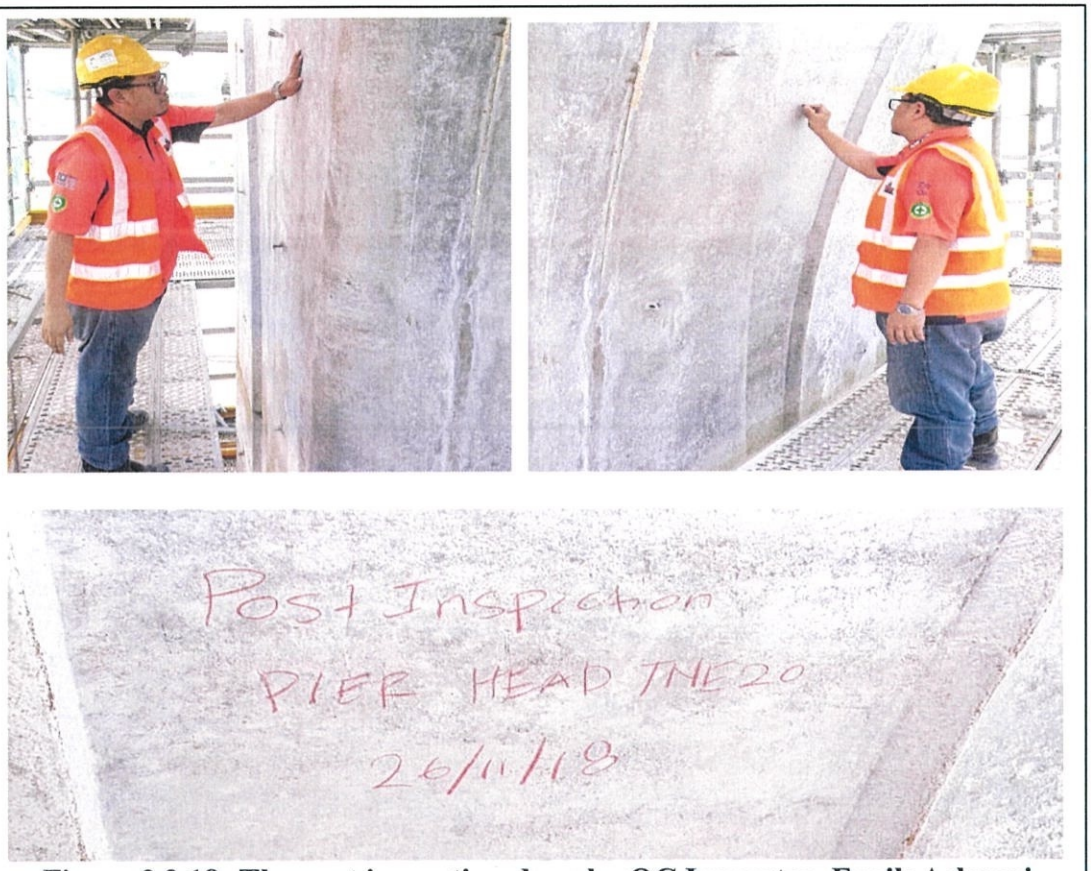



**Figure 3.2.18: The post inspection done by QC Inspector, Encik Ashrani**

The formwork removed were inspected again for distortion or damaged. Distorted or damaged components should be repair or replaced.

Otherwise, irreparable components should be identified and set aside to prevent unintentional use.

**Figure 3.2.19: The repairing of dismantled formwork**

For continuing the construction process of pier, it is fundamental to know the overall height of the pier. For this study, pier KLN08 was chosen as references. The pier height is 22,642mm. Due to the height, the lift for construction of pier must be divided with the maximum height of mould which is 4m. There will be 6 lift of pier to construct. For the second lift, third lift, fourth lift and pier head will be the same procedure except the fifth lift. This is because we need to aware how long is the length of pier left to be construct by using the rigid length of steel mould. There are 3 sizes for mould pier which are 1m, 2m and 3m while there is only one fixed sized for mould pier head which is 4m.

So, in this case, the length of the fifth lift is 2,622mm. After we know the length of the fifth lift, the 3m mould pier was chosen to use to construct it. The priority step is to dismantle all mould below the fifth lift. This step is important because after installation and inspection of rebar, a stand jack was installed to support the 3m mould for the fifth lift. Refer to figure for the step by step of installing the stand jack. After done installed the stand jack, the 3m mould was installed at the pier and the processes are the same as the previous lift. For the last lift which is the construction of pier head was the same method. The different was the shape of the 4m steel mould used.

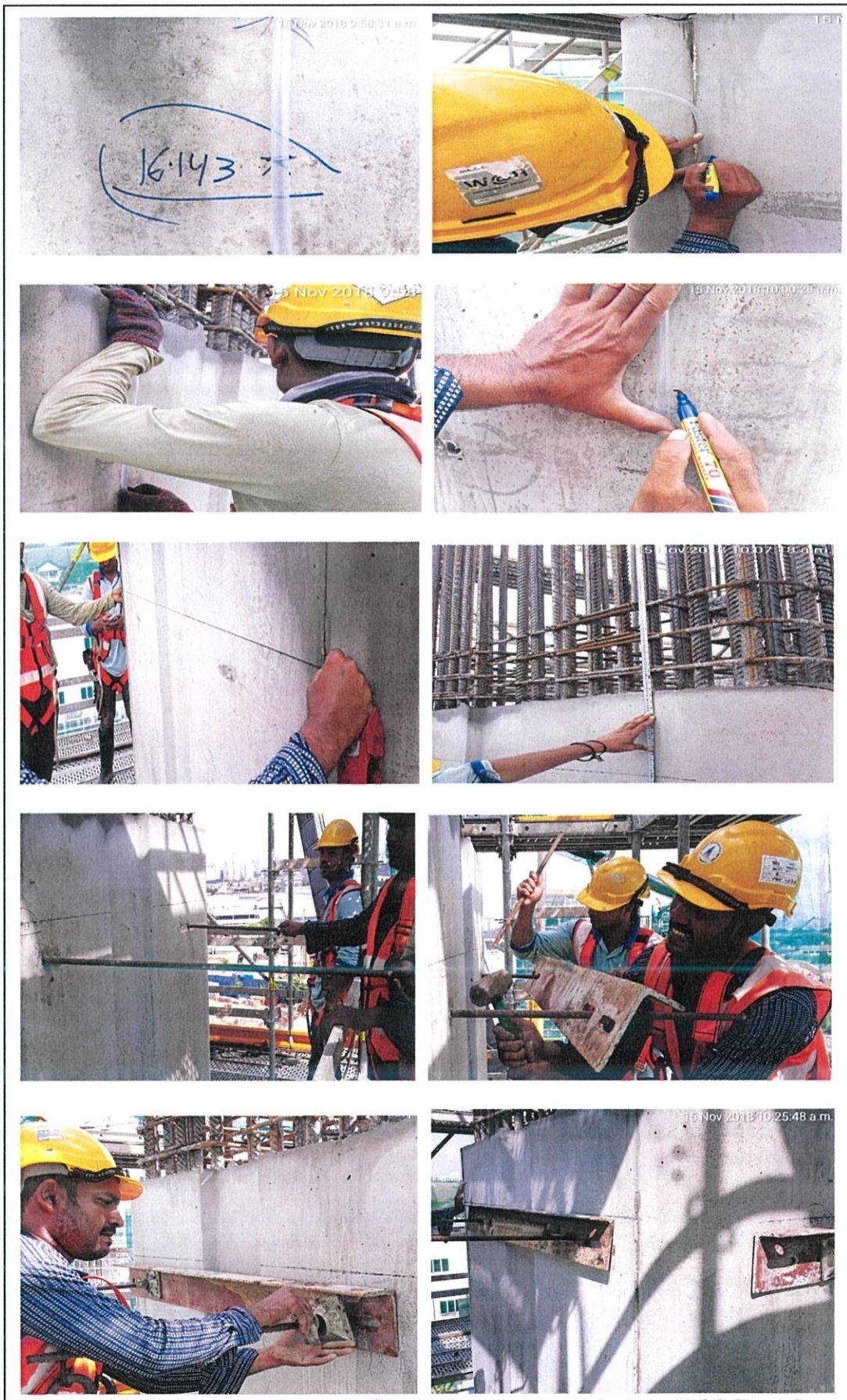
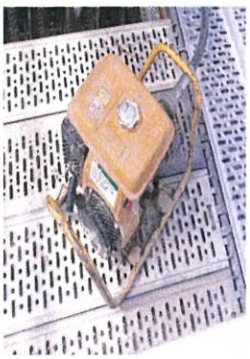



**Figure 3.2.20: The step by step of installing the stand jack by BCSC workers.**


**Figure 3.2.21: The final product of pier KLN08 at Kuchai Lama Station.**

**The plant and equipment used during the construction of pier**

| Item | Equipment | Usage | Diagram |
|---|---|---|---|
| 1. | Mobile Crane | To hoist equipment and material<br>To supply and place concrete |  |
| 2. | Concrete Bucket / Hopper / Chute | To place concrete |  |
| 3. | Steel Mould Formwork | To form structure |  |
| 4. | Vibrating Pokers<br>Tube length – 500mm<br>Tube Diameter – 50& 75 mm<br>Hose Length – 6m | To compact concrete during placing of concrete |   |

| | | | |
|---|---|---|---|
| 5. | Lighting Equipment | To light up working area during night works |  |
| 6. | Bending & Cutting Machine | For rebar fabrication work |  <br>  |
| 7. | Turn buckle | To align mould for first cast only. |  |
| 8. | Stand jack | To withstand the steel mould formwork below the pierhead mould. |  |

### 3.3 The concrete defects of pier and ways to rectify.

There are different types of defects in concrete structures can be cracking, crazing, blistering, delamination, dusting, curling, efflorescence, scaling and spalling. These defects can be due to various reasons or causes. In my project, the most common defect that been issued to NCR is the segregation of concrete.

Honeycomb is the rough pitted surface or voids in concrete formed due to improper compaction or incomplete filling of the concrete. Voids form when concrete fails to fill areas in a form, typically those under large blackouts, in very deep placements, or that are heavily reinforced. It is also may due to cramped spacing that unable vibrator to enter during casting or poor workmanship(Ed Larry S.Hage, 1998)

Within construction, quality management is the system used to assure the safety of the project. It ensure that buildings are built to code and users will be safe inside them. Quality assurance and quality control together build quality systems management. So, it is vital to make sure that the pier of this project is in safe and secure condition. There are many defects will be encounter throughout this project that need to be solved such as honeycomb, cracks and air bubble.

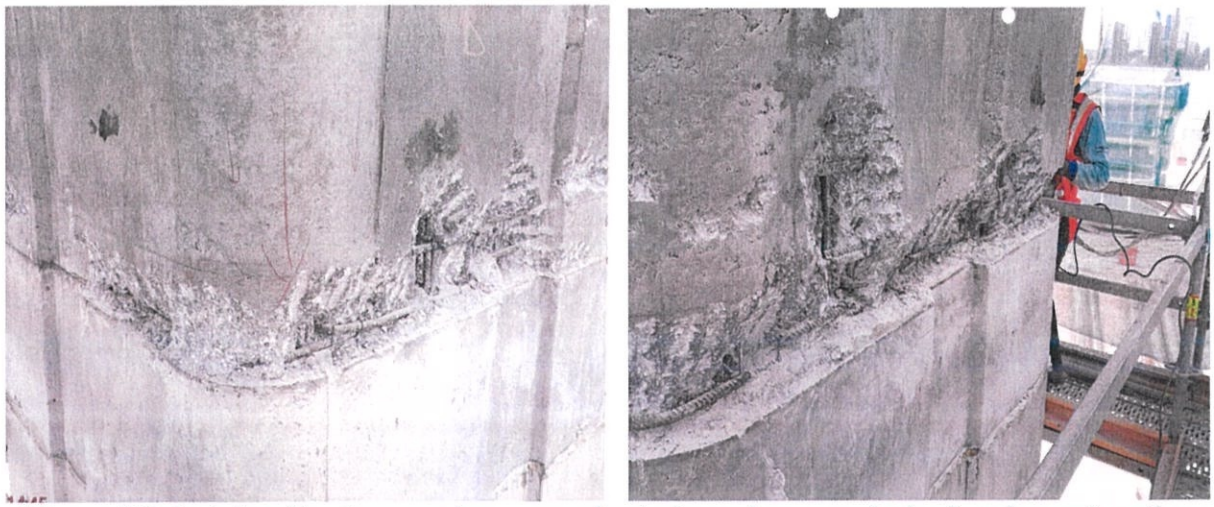


**Figure 3.3.1: A localized severe honeycomb at pier column and pier head construction joint at TNEN15 Kampung Malaysia. The root cause is insufficient of vibration during concreting works. This is NCR-00679**

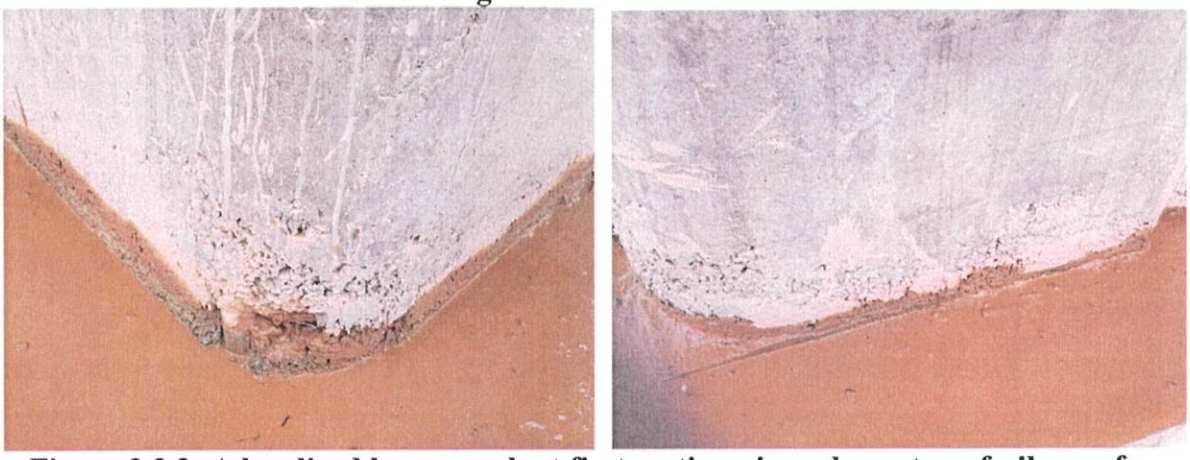


**Figure 3.3.2: A localized honeycomb at first casting pier column top of pile cap from NCR605 issued on 13th July 2018.**

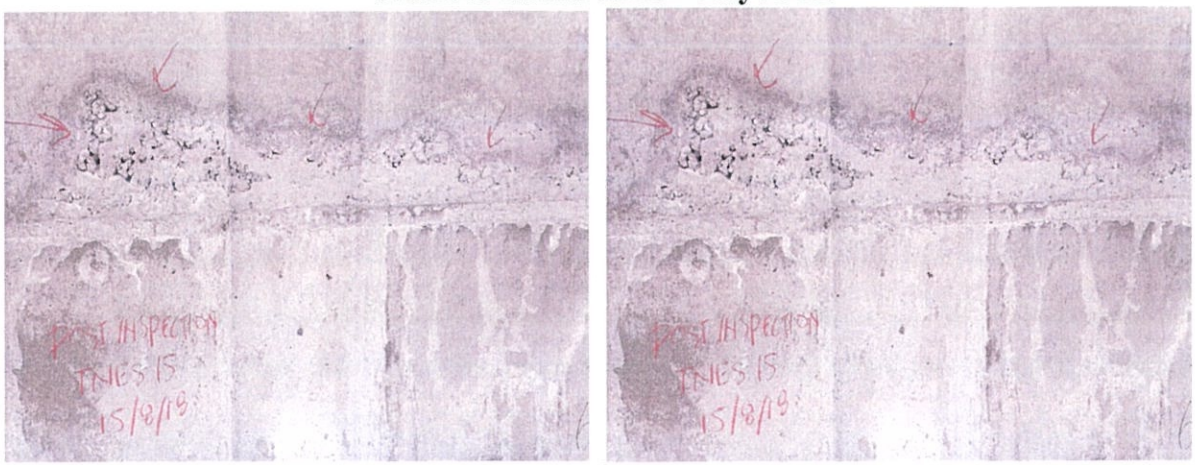


**Figure 3.3.3: NCR-00680 was issued on 20th August 2018 about a localized honeycomb pier at the third lift construction joint and just above the pile cap.**

The surface preparation of the concrete to be repaired and the mixing, application and curing of the (proprietary) repair material was as per manufacturers requirements/recommendations and /or the specifications applicable for concrete to be followed if specific requirements are not given by the manufacturer.

Post-concreting inspection shall be done to identify all the defects and must get approval from PDP/SC to carry out the repair works.

The method of rectification of honeycomb at reinforced concrete structure are depends on how bad the defects are.

For NCR-00605, the method of the rectification was pressure grouting method because it is a major honeycomb. Before carrying out the hacking works, about 10-20mm area concrete surrounding the honeycomb was cut to prevent father edge by using grinder to hack until reaching sound concrete and remove all particles. After completion hacking, follow by cleared off the concrete debris by blowing off. Then, the affected area was applied grout by gravity method / pressure grout by installing formwork first. Inlet and outlet nozzle were fixed at lowest and highest part/point on the formwork. Carry out mixing of Sika Grout 215 with 4.0 - 4.4 litre of clean water with 25kg grout into the clean container. Then, mixed and stirred lightly using rotating stirring paddles 2 to 3 minutes with the speed up to 500 rpm. Carry out pumping of the grout by using pumping machine with pressure not more than 15 psi.

Removal of formworks 24 hours after rectifying the above grouting. The concrete was cured by spraying the surface with water. Lastly, Final touch up concrete surface with pressure grout to ensure smooth concrete surface.


**Figure 3.3.4: The Sika Grout 215**

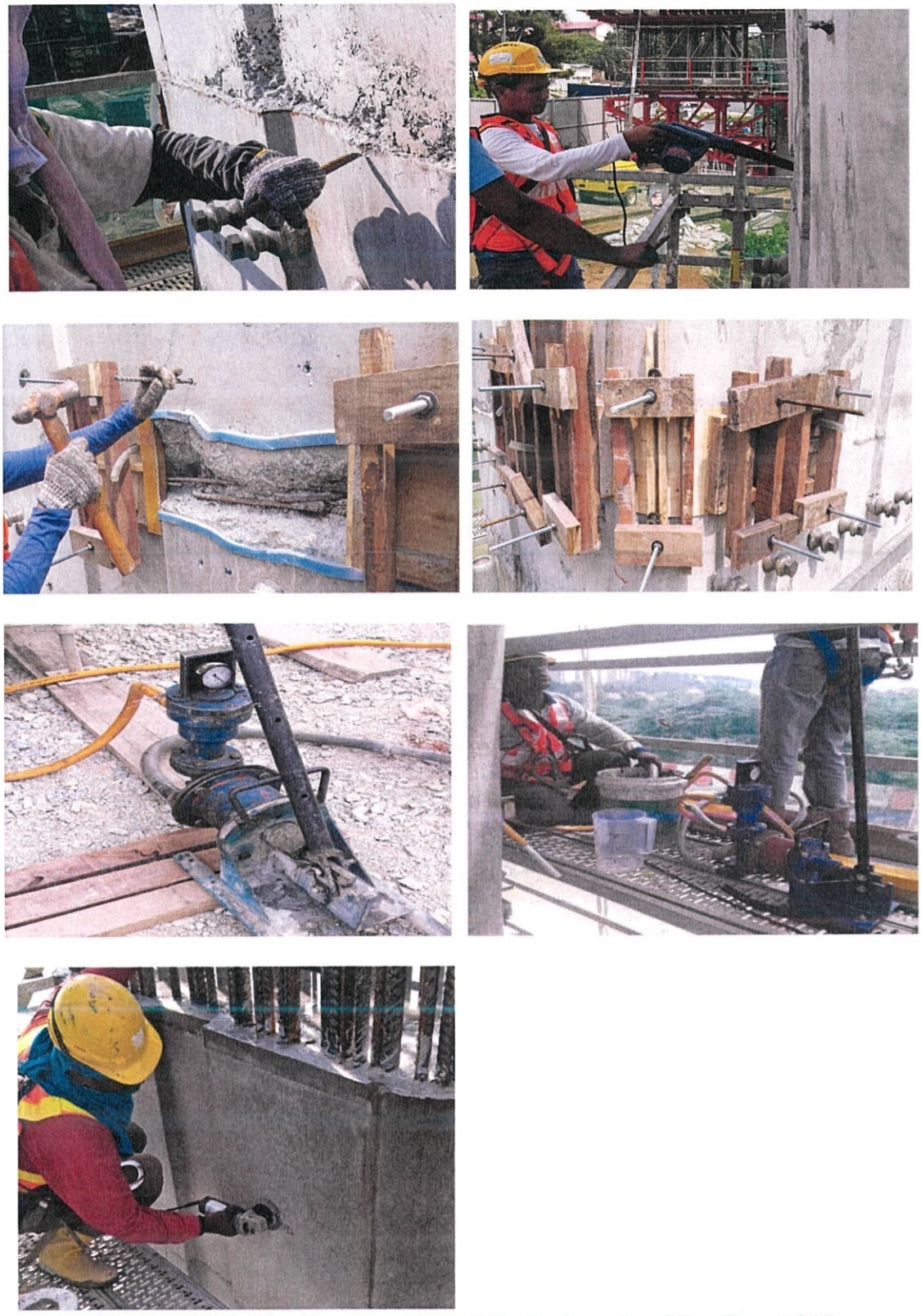
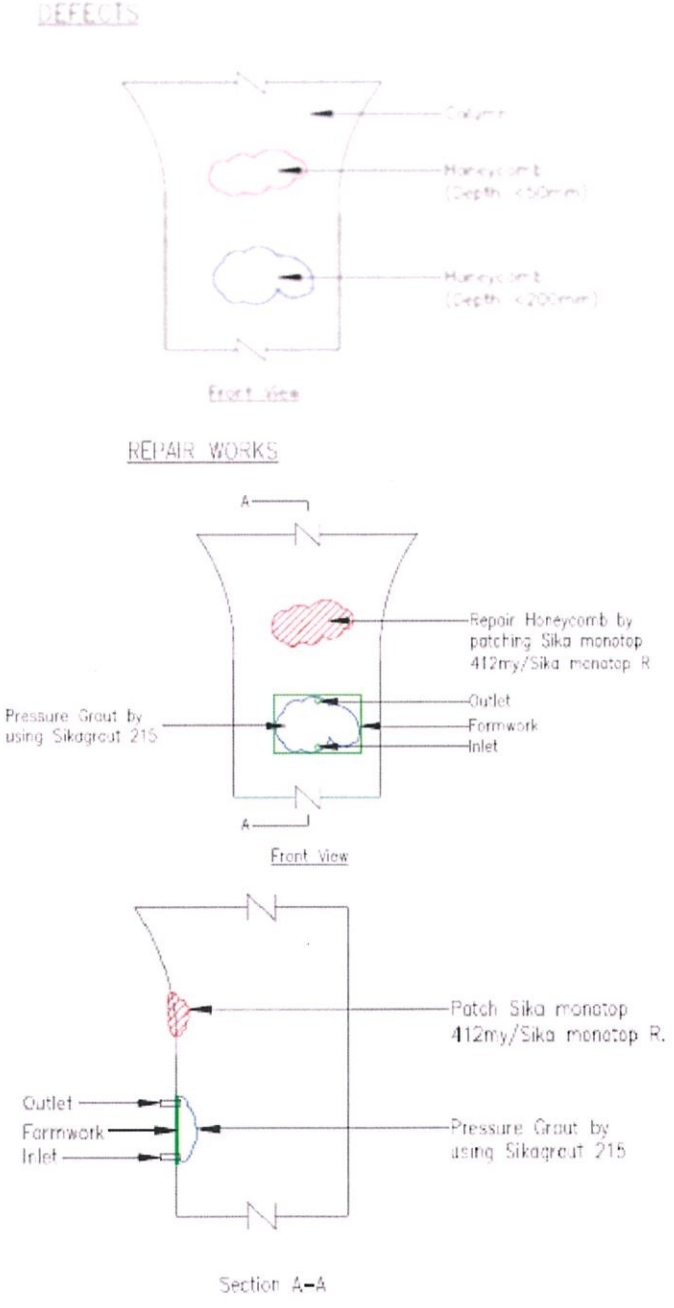


**Figure 3.3.5: The Pressure Grout Works by using Sika Grout 215**

For minor honeycomb, patching repairing method was used to rectify the defect. All loose concrete was hacked and removed till finding of sound concrete. The repair materials used was Sika Monotop 412 MY for depth less than 50mm and Sika Monotop R on less than 20mm depth.

The material was mixed using hand mixer with water with a good care to minimize air entrainment during mixing. Compact well and force material against the edge of the repair, working towards the center. Finish off the top surface with trowel.



### 3.4 The construction's impact on the environment

Construction projects around the world have a significant impact on our environment and global scale. Every stage of the construction process has a measurable environment impact such as the transportation of these materials to the building site from sources, the construction process itself and the waste removal and disposal process that follows the completion of the project. With a rapidly developing global economy, it is crucial that we understand how the construction projects we undertake impact the environment and how we can measure and reduce that impact in the future. This objectives discusses the impact of construction project on the environment and how the contractors work to reduce it.

All activities at work site shall comply with requirements stated in Environmental Management Plan for Construction and Completion of Viaduct Guideway and Other Associated Work from Bandar Malaysia South Portal to Kampung Muhibbah Package All activities at work site shall comply with requirements stated in Environmental Management Plan for Construction and Completion of Viaduct Guideway and Other Associated Work from Bandar Malaysia South Portal to Kampung Muhibbah Package V204. Guideline of this mitigation are tabulated in Environmental Aspect & Impact Register as per Package V204 Guideline of this mitigation are tabulated in Environmental Aspect & Impact Register.

3.4.1 Erosion and Sedimentation Control

- To ensure the water runoff will channel to silt trap/sediment basin
- To install Best Management Practices (BMP`s) along drainage/public drain
- To regular monitor and maintenance to BMP`s installed.

3.4.2 Water Quality

- To ensure there is no water direct discharged from project site to public drain
- All water runoff must be go through silt trap to filtered before discharge to public/monsoon drain
- Baseline for water quality monitoring will be conducted to the affected river or monsoon drain that near to bore piling activity.

3.4.3 Noise and Vibration Control

- To install noise barrier/hoarding
- To carried out within approved working hours.
- Continuous noise monitoring over the entire duration location of piling.

3.4.4 Scheduled Waste Management

- Any spillage or leakage of oil on the ground must be cleaned immediately
- Contaminated soil due to oil leakage from machinery must be collected, stored properly and treat as Scheduled Waste as per EQA 74 (Scheduled Waste Regulation 2005)

3.4.5 Waste Management

- Construction waste such as broken bricks and concrete building must be segregated from wooden waste. Stockpiled must be covered or need to transport out for daily basis.
- Construction waste must be disposed at approved landfill.
- Scrap metal, rebar and timber waste must be sent to approve recycle contractor.
- Appropriate bins must be provided near the bore piling area

During observation by PDP SHE SHO, it was spotted that there was a potential erosion due to exposed slope at P12 -P13

**Figure 3.4.1: Exposed sandy slope**

The immediate action taken by the PIC is to cover the exposed sand slope and install silt fence at the edge of the slope. The PIC & Environment team need to monitor closely and to take prompt action to cover the exposed slope to prevent erosion. Any issue on slope protection need to take fast as to action as to prevent slope erosion and slope failure.

**Figure 3.4.2: The details of action taken that the sand slope has been protected with ECB**

# CHAPTER 4.0

# CONCLUSION

The increases in the population in Klang Valley and Kuala Lumpur (KL) will increase the needed of the transports in that area neither in the public transport nor the private transports. In connection with the actions of the government's plans to establish a public transport system; Mass Rapid Transit in the Klang Valley. The method for the construction of this pier is worldwide use to build bridges. The concept of constructing the pier is the equivalent to bridges construction.

There are many benefits of constructing the cantilever pier as the main advantage of a cantilever bridge is that support is required only on one side of each cantilever. A simple pier can be used as support structures. Cantilever designs cost less to build because of their uniformity and they don't require temporary supports during construction, which helps to speed up the process. But cantilever bridge designs do require precise engineering because the counterbalance weights can affect their strength if incorrect, especially if contractors build the segments slightly differently.

The quality assurance and quality control QAQC in a construction firm is very crucial as it maintain and protect the value of our works. It is not just the responsibility of one person or the QAQC team itself in the organization. Everyone should involve directly or indirectly in the production of an item. Unfortunately, something that is viewed as everyone's responsibility can fall apart in the implementation phase because one feel that other person will follow the appropriate procedures.

Thus, what is needed is a system that ensures all procedures that have been designed and well planned are followed. This is also apply to the environmental aspects as we need to keep in mind that it is necessary for all contractor to develop an environmental policy. Not only because of the sole reason, The Environment Quality Act 1974 for an instance to be followed, contractors need to be aware of their impacts on the environment. A failure to consider environmental effects can test the financial stability of even the best of companies.

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