DEPARTMENT OF BUILDING

UNIVERSITI TEKNOLOGI MARA

(PERAK)

Passenger Lift Installation in Academic Complex at Sultan Azlan Shah Campus, Universiti Pendidikan Sultan Idris, Tanjong Malim, Perak Darul Ridzuan.

Prepared by:

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FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING

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DECEMBER 2018

It is recommended that the report of this practical training provided

By

NUR ANATI HUSNA BINTI NORISHAM

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entitled

Passenger Lift Installation in Complex Academic at Kampus Sultan Azlan Shah, Universiti Pendidikan Sultan Idris.

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

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ACKNOWLEDGEMENT

Alhamdullilah, I am so grateful as I managed to completed this task successfully.

First of all, I would like to express my great appreciation to my beloved lecturer, En Muhammad Redza Rosman for his guidance for me to complete this report successfully. I would also like to thank my parents for giving me the facilitator to complete this report. I also would like to thank all of Halapasti Sdn Bhd staff especially En Ramas A/L Sinnakkanoo, project director, Encik Ahmad Ismisabri, project manager and my supervisor, Encik Izzat Akmal Bin Zuber. They have helped me along my industrial training with a lot of guidance by giving answers towards all of questions that I asked and a full support for me in order to complete this internship training. Finally, I would like to thank to all persons who are involved directly or otherwise.

I would like also to thank all of UiTM lecturers that have taught about this studies. I would also like to extend my deepest appreciation to the lecturers to En Muhammad Redza Rosman as my Supervising Lecturer, En Muhammad Naim Bin Mahyuddin, Practical Training Coordinator and Dr Dzulkarnaen Bin Ismail as the Programme Coordinator. I appreciate the time, effort and ideas that they have gave me along the time of my training. Thank you again.

ABSTRACT

Elevators can be used to control access to certain areas of a building by either controlling the access to the elevator or controlling where the elevator can stop, therefore this report will discuss about the installation of a lift that use machine room less and traction system type. This report were conducted for the building envelope at Academic Complex of Universiti Pendidikan Sultan Idris, Tanjong Malim. The objective of this report is to provide a better transportation in a building between three levels. Next, according to Muhammad Adam Abdullah (2000), Teknologi Pembinaan Bangunan, DBP, lift can ease the transportation for persons and materials, in vertical direction. This report also will prove how a lift could increase comfort and effectiveness of human circulation in the building. Every parts of lifts have it owns function. Those parts will play important roles in order to make the lift well function. Besides that, mechanical transportation such as lift need a safety features to ensure that it can work in a safely.

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CHAPTER 1.0

INTRODUCTION

1.1 Background and Scope of Study

This study is carried out in Universiti Perguruan Sultan Idris, Sultan Azlan Shah Campus, Tanjung Malim, Perak Darul Ridzuan. In order to build a building, a lot of aspect should have been considered to make sure the final product can be use comfortably and safely. Other than focusing on substructure and superstructure works, building services also play a big role to convey people that the building is good enough.

A transportation or circulation systems include the sub-systems that provide the transportation between the spaces on the same flat or different flats. The mechanical transportation of people and goods is an energy using service that requires designer's attention at the earliest stage of building design. Mechanical transportation such as passenger lift is actually necessary in all building over three storey high.

1.2 Objectives

1. To study the importance of every components in passenger lift.
2. To investigate the traction system control and benefits using machine room-less lift.
3. To describe the method of installing passenger lift in Academic Complex.

1.3 Methods of study

1. Observation – The first thing that was gained through the observation was the installation of the passenger lift. It involves the interior component of the lift, the exterior component and final task for the passenger lift. There are a lot of process required when installing the lift. This process takes roughly about 1 month and a half. All of the information is obtained by video recording, pictures and by some notes writing.

2. Interviews – Several unstructured interviews has been done along the installation process. A bit explanation that have given by the labors contribute a lot in writing this report. Some of the engineers, supervisors and consultants also have given a simple help by explaining the details of the lift installation.

3. Document reviews – The other method is by referring and studying some documents such as engineer drawings for passenger lift, construction drawings, standard operating procedures and company profile.

CHAPTER 2.0

COMPANY BACKGROUND

2.1 Introduction of Company

Halapasti Sdn Bhd was incorporated under the Companies Act on the 12th. April 1994. The company is primarily operating in the construction industry including sewerage and landscape works. The company has also been fully operational in Seri Manjung, Perak and has been registered with the Companies Commission of Malaysia (SSM), the Contractor Services Center (PKK) and the Construction Industry Board of Malaysia (CIDB) which is in G7.

Halapasti Sdn Bhd is a wholly owned company by a group run by three (3) highly qualified and experienced directors in the field of marketing. The goal of this company is to create a more vibrant and viable organization in line with Vision 2020.

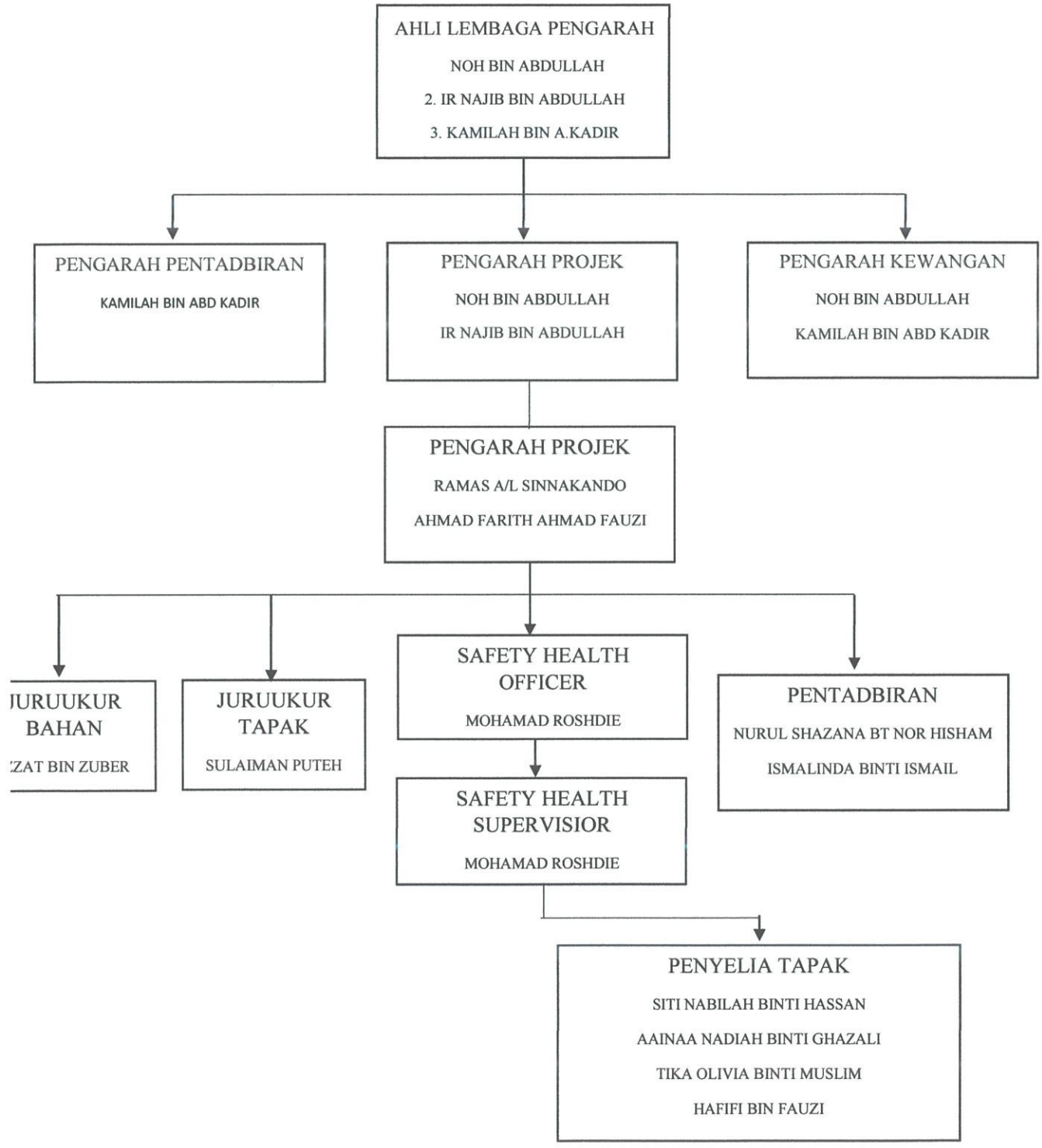
2.2 Company Profile

Table 1.1: Company Profile

COMPANY NAME	HALAPASTI SDN BHD
REGISTERED ADDRESS	73, UPPER FLOOR, PERSIARAN PM/1, PUSAT BANDAR SERI MANJUNG, 32040, SERI MANJNG, PERAK.
DATE OF INCORPORATION	22 APRIL 1994
COMPANY REGISTRATION NUMBER	29511J H
PERKESO REGISTRATION NUMBER	D4505378X
KWSP REGISTRATION NUMBER	012764626
AUTHORIZED CAPITAL	RM 1,000,000.00
PAID CAPITAL	RM1,000,000.00
TEL/FAX NUMBER	
E-MAIL	nohhpsb@yahoo.com
COMPANY SECRETARY	KAMARUL AZHAR BIN DAHAMAN HURI PUSAT PERDAGANGAN MANJUNG, JALAN LUMUT, 32040, SERI MANJUNG PERAK.
BANK	MALAYSIAN BANKING BERHAD, LUMUT CIMB, LUMUT
BUSINESS FIELD	KONTRAKTOR KEJURUTERAAN AWAM, BANGUNAN, PEBENTUNGAN, DAN LANDSKAP

2.3 Organization Chart

Chart 1.2: Company Organisation Chart



2.4 List of Project

2.4.1 Completed Project

Table 1.3: List of Project (Completed)
Source: Halapasti Sdn Bhd

BIL	NAMA PROJEK	STARTING DATE	COMPLETED DATE	VALUE (RM)
1	PROJEK PEMBANGUNAN SEMULA PERKAMPUNGAN NELAYAN DI KG MASJID, PULAU PANGKOR DAERAH MANJUNG, PERAK (JKR) UNTUK TETUAN WARISAN SEPAKAT SDN BHD	15/07/16	14/08/18	5,645,644.80
2	MEMBINA MASJID BARU DI BANDAR UNIVERSITI, SERI ISKANDAR, PERAK DARUL RIDZUAN (ICU) UNTUK TETUAN MISSIE SDN BHD	29/08/16	31/05/18	3,468,027.25
3	KERJA-KERJA MEROBOHKAN STRUKTUR KONKRIT DAN ANGKUT BUANG DI PULAU LALANG, WILAYAH PULAU SEMBILAN, BAGAN DATUK UNTUK TENTUAN DOLOMONT DEVELOPMENT SDN BHD	12/09/17	02/10/17	959,712.00
4	MEMBINA DATARAN KEJAT SIMPANG 4, HUTAN MELINTANG UNTUK TENTUAN GREENTECH INTEGRATED	23/06/17	22/12/17	867,840.00

Table 1.4: List of Projects (Completed)

Source: Halapasti Sdn Bhd

BIL	NAMA PROJEK	STARTING DATE	COMPLETED DATE	VALUE (RM)
5	MEROBOH DAN MEMBINA SEMULA MASJID BARU KAMPUNG SUNGAI TIRAM, BATU 10 SITIAWAN, PERAK DARUL RIDZUAN (PLB) UNTUK TENTUAN DOLOMONT DEVELOPMENT SDN BHD	06/10/14	30/06/16	3,220,800.00
6	CADANGAN UNTUK UBAHSUAI DAN MENAIKTARAF RESTORAN TERAPUNG TELUK DALAM KEPADA RUMAH REHAT KERAJAAN NEGERI PERAK, TELUK DALAM, PULAU PANGKOR, PERAK (MPM)	14/04/14	31/12/15	4,129,276.08
7	CADANGAN NAIKTARAF LANDSKAP ZON REKREASI KELUARGA (LEMBAH KIARA) DI TAMAN PERSEKUTUAN BUKIT KIARA KUALA LUMPUR	26/08/13	16/05/14	3,970,179.80
	MENAIKTARAF JETI BAGAN DATOH TERMINAL JETI PELANCONGAN BAGAN DATOH, PERAK DARUL RIDZUAN (MPTI) UNTUK TETUAM WARISAN SEPAKAT SDN BHD	01/09/16	20/08/18	7,159,680.00

2.4.2 Project in Progress

Table 1.5: List of Projects (In Progress)

Source: Halapasti Sdn Bhd

BIL	NAMA PROJEK	STARTING DATE	COMPLETED DATE	VALUE (RM)
1.	CADANGAN BAGI MEMBINA, MENYIAPKAN, MENGUJI DAN MENTAULIAH SEBUAH KOMPLEKS AKADEMIK SERTA KEMUDAHAN SOKONGAN DI KAMPUS SULTAN AZLAN SHAH, UNIVERSITI PENDIDIKAN SULTAN IDRIS, TANJONG MALIM, PERAK	02/05/17	01/05/19	26,271,550.00
2.	MEMBINA DAN MENYIAPKAN BANGUNAN SEKOLAH 3 TINGKAT SEKOLAH MENENGAH AGAMA RAKYAT (SMAR) BATU 7 LEKIR	06/04/16	21/11/18	3,736,850.00
3.	MEMBINA BARU MASJID AL-MANSOR, PARIT 17A, SUNGAI LAMPAM, TELUK INTAN, PERAK (ICU) MISSIE SDN BHD	14/05/18	13/05/19	2,859,500.00

Chapter 3.0

CASE STUDY

3.1 Introduction to Case Study

The project to build this academic complex has started on May 2, 2017 and is expected to be completed by May 1, 2019.

The new UPSI Academic Complex worth nearly RM 27, 847, 843 and were designed according to the specifications set. The complex contains 3 large buildings blocks and the main block is located between the three buildings blocks.

Other than the special facilities in other blocks, the main building in this complex have a passenger lift that will operate in the main block of this academic complex. Installation of this lift was carried out by subcontractors, namely Megatech Sdn Bhd which is also responsible for the mechanical and engineering work of the project. The company has chosen the Hyundai brand lift to be installed. The ordering process of this lift component takes a month. After this component arrived, the installation of the lift will be carried out immediately because the components involved should not be placed in the storage of the goods. Site setting out for this elevator takes about 20 days. For elevator car installation, elevator motor installation and testing and commissioning work also takes 20 days. The amount of time allocated for this installation lift is for 80 days.

3.1 Passenger lift details.

3.1.1. Components.

The type of lift used in this project is passenger lift. It consists of two basic types of operation named traction and hydraulic type. For this project, Traction system has been adopted for this elevator system. The first basic component for a lift is control panel. It will receive the signal sent from the buttons and it can control the electric motor. Electric motor also works for turns and halts the sheave. Next, the weight and lift car counter is the objects that are attached to the traction rope, and the sheave will make to its direction. Next is the counterweight that can lift the load more efficiently. These counterweight are usually made of iron and cast iron. For the last basic components is the guide rails that will secure the lift car and also counterweight.

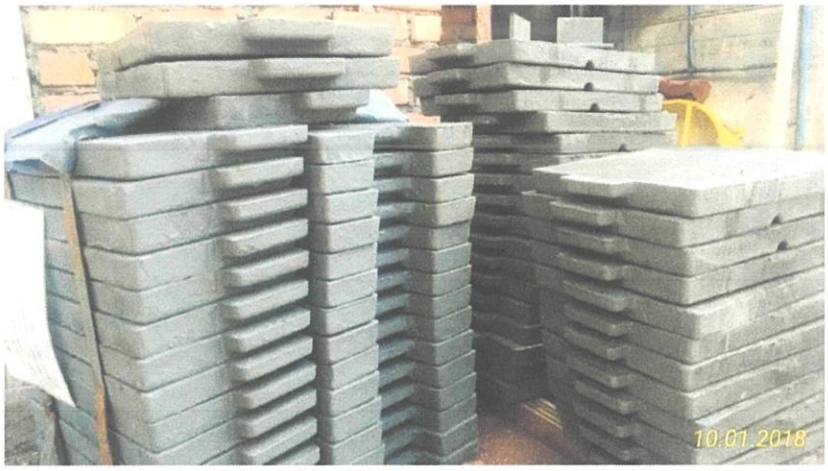


Photo 2.1: Counterweight

Photo 2.2: Car Counterweight

3.1.2. For traction system, according to Ascension Elevators (2017) the first component involve other than the basic components is traction machine that work as the key for the system to do well. It will move the car ropes and incorporate a motor and a brake. The traction sheave is connected directly to the motor shaft, and the motor rotation (speed) directly regulates the traction sheave. Next is the Governor that works to activate the safety gears by the governor ropes when the car speed has exceeded its limit. The 7th components that play a big role in order to get the passenger lift works is the Governor Rope. It is used to activate the safety gears and Main Rope will connect the car and the counterweight.

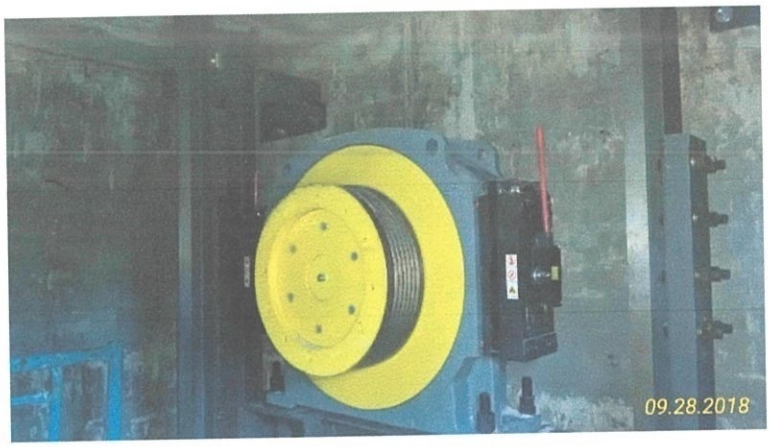


Photo 2.3: Governor

Another components that is also involved is the control panel, as it can control the elevator operation. The next one is hoist way, a space to install the hoist way equipment and where car travels. Next Maintenance Balustrade will prevent maintenance person from falling into the hoist way during work on the top car. For Car Door Operator, it will works for opening and closing car doors. Last but not least, Hall position indicator with hall call buttons will shows the car's current position and direction while Compensation Chain are used to compensates for the weight of the suspension ropes.

Photo 2.4: Hoistway

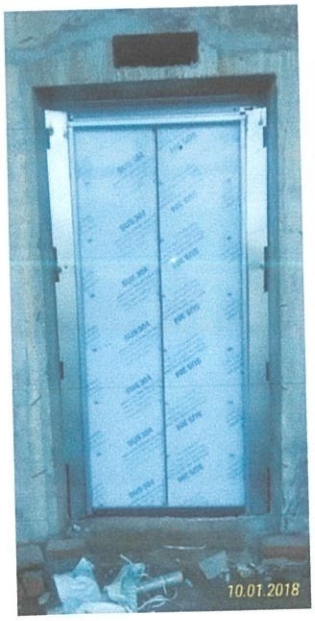


Photo 2.5: Elevator Door

Basically, all of the passenger lift components in traction system are all important as it play their own roll in other for the lift to work efficiently. If one of these components are not installed carefully and with the right way, it will cause disturbance to the lift to work well.

The lift is primarily composed of cars, pull systems, train guides and control systems. The car is used to hold passengers or articles, including control panels. Passengers send the required level signal to the control system via the same button on the control panel, or directly control the opening and closing.

The grip parts include pull steel cable, pulley group, motor in machine room and stranded steel wheels, and the weight is added to the tip of the pull steel cable. When the motor drives the twisting wheel of steel cables, the elevator is pulled up and down with friction. For safety, lifts are detected by a group of steel cables, and each steel cable can withstand the weight of its attractiveness alone. Transmission of traction is generally divided into two types of retarder and no retarder type. The former passes the spindle motor spin on the cable winch by the reduction of the turbine vortex rod, which is directly mounted on the main stem of the electric motor by changing the steel cable winch, and speed is controlled by changing the magnitude while passing the motor. To make cars and scales do not have side movements during vertical movements, car guiding and rear weight guides are set up respectively.

Commonly used automatic lifting using centralized control mode. Control system consists of car interior control panel, waiting door control panel, hierarchical control memory and lift control cabinet. The control board function is to send the passenger command signal. Hierarchical control memory keeps passenger commands in cars and waiting doors, and regulates call hierarchy programs according to high priority rules and so forth, issuing ascending, dropping and stopping instructions. Elevator control cabinets control acceleration, deceleration, positive rotation, reversing and closing of motor according to ascending, falling and stop instructions.

Many lifts in tall buildings are usually operated by automatic group control. The control system consists of 3 ~ 8 lifts. According to the number of passengers in the cabin, directions inside and outside the car, location of the elevator and the location of the car, elevator operation is automatically sent.

3.1.1 Standard & Optional Features

Table 1.5: Standard and Optional Features

Source: Halapasti Sdn Bhd

NO	ITEMS	DESCRIPTIONS	MARKS
1	Selective Collective	The first call determines the direction of the elevator. All calls opposing the respective direction are serviced after carrying out by the calls of the respective direction.	Standard
2	Duplex Selective Collective	2 units of elevator provide the effective service for the common calls	Optional
3	Automatic Bypass	When a car is 80% loaded, it will automatically bypass all calls as the bypass load weighing device is activated.	Standard
4	Arrival Voice	It provides an audible indication in the car that an elevator is about to arrive	Standard
5	Signal Fixtures	Dot matrix type (moving direction) Hall Lantern	Standard Optional
6	Single side safety edge of door	Contact with a passenger or inanimate objects causes the door to stop and reopen automatically. The elevator doesn't start if the door is not completely closed.	Standard
7	Ventilation Fan	Car Ventilation is smooth with ventilation fan built in the ceiling	Standard
8	Emergency Car Lighting	In case of power failure, it automatically turns the emergency light in the car.	Standard
9	Automatic interruption of light and ventilation fan	The lights and ventilation fan are automatically turned off to save energy if there is no call registered for a period of time. If there is a call registered again, it works again.	Standard

10	Car door interlock switch	When the door is opened, the switched installed at the door operator is activated and keeps the car moving. During operation of the car, it locks the door completely so as not to open the door from outside.	Standard
11	Overload features	To protect the overload of an elevator, this device sounds a buzzer and the elevator remains stopped at the floor when the number of passengers exceed the rated capacity. When the excess number of passengers get out of the car, the buzzer stops and the elevator door closes.	Standard

NO	ITEMS	DESCRIPTION	MARKS
12	Safety drive	During the operation if the car stops between floors, and safety device doesn't work, the car automatically moves to the nearest floor with the low speed. Then, it opens the door to allow the passengers to exit off.	Standard
13	Multi Beam door protection	Multi beam from the top to the bottom of the door senses any obstruction caught in the door. It makes the door reopen and stay open until the obstruction is removed.	Optional
14	Fire emergency service	When a fire breaks out, all cars activated by the switch or fire detector are immediately called to a specified rescue floor for the passengers safety	Optional
15	Anti-nuisance	Evaluates the number of people on the car and compares that value to the numbers of the car calls registered. If the numbers of car calls exceeds the number of people in the car by the load sensor, the car call exceeding the number of passengers will be cancelled after service nearest call only.	Optional
16	Voice synthesizer	A voice synthesizer with microprocessor makes announcements to inform passengers of various conditions, including landing floor and operation direction, etc.	Standard
17	Fireman's emergency service	When the fireman's switch located at the main floor lobby and operating panel on the car is activated during a fire or emergency, a designated car can be called back to a specified floor for firefighting service.	Optional

18	HELMON (Hyundai Elevator Computer Monitoring) System	This system has various functions, like elevator monitoring and control by a personal computer and modem	Optional
19	Attendant Service	It is activated when the attendant turns on the ATT switch in the car operating panel to ''ON'' position.	Optional
20	Earthquake operation	When the seismic sensor detects and earthquake that exceeds a predetermined level, all cars promptly proceed to land at the nearest floor and park with the doors open to allow passengers to exit out safely.	Optional

3.2. Traction System

Traction Lifts is a lift car and a counterweight that is connected at the end of the cable end that will travel above sheave at the of the elevator shaft. Traction system able to move quicker than the hydraulic system. This system is usually more energy competent. This is because when the car lifts the counterweight will go down and rise. Balances and elevators will play their duty to offset each other. Compared to a hydraulic system that uses a pump works against gravity to push the lift car and contents up. This traction lift is elevated by ropes. They are used for medium and high rise buildings. Rails will be balancing lift car and counterweight which will move vertically inside the shaft. This is to make sure that it does not route away from the path. Rails also work for decelerating in emergency situations.

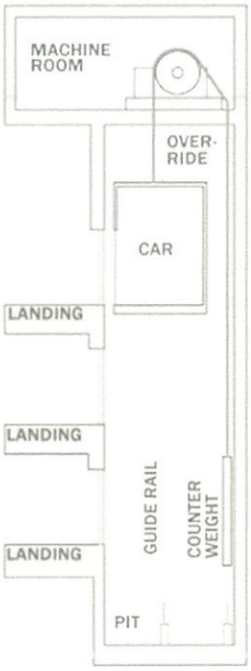


Figure 1

Source: archtoolbox.com

3.2.1 Machine Roomless Elevator Systems

The traction system is divided into 4 structure concept that is Geared type, Gearless, Machine Room Less (MRL) and freight. At this construction site, Machine Room Less (MRL) lift has been adopted. This lift type could save more cost.

Machine Room Less elevator is an innovative elevator which does not require a separate machine room. This elevator doesn't have an immovable machine room at top of the hoist way, as an alternative the traction hoisting machine is mounted also on the top side wall hoist way or on end of the hoist way. Unevenly of the hoisting machines used gearless motors as a replacement for conservative induction motors. It will abolishes the requirement of an immovable machine room and can saves building's space.

Secondly, MRL elevator will save a noteworthy amount of energy as compared to hydraulic elevators. The power feeders for it are also significantly reduced. This is because it have more competent design and the counter-balancing provided with traction equipment.

Next, MRL elevator removes the conservational concerns related with a buried hydraulic cylinder. Through the years, hydraulic elevators have come under better study relative to conservational concerns due to the hidden hydraulic cylinder. This is because the MRL elevator is a traction elevator with all its components overhead ground.

The MRL elevator uses a gearless traction type machine, which outcomes in greater performance and ride value compared with hydraulic elevators. MRL's can also work at quicker speeds thus grow the awareness of quality over a conventional hydraulic elevator.

3.3. Method of installation.

Before the main equipment of lift was installed, several site preparation works should be complete. All of the hand tools, installation tools, and lift equipment should be placed near the elevator shaft. This is because it will make the work easier to be lifted at the upper area.

Photo 2.7: Mobilisation

Photo 2.8: Equipment

The area involved for installing lift equipment was secured to avoid any hazard from outside. When the equipment has arrived at site area, it should be checked by supervisors to make sure it was the approved material. Personal Protection Equipment such as safety helmets, safety shoes and harness for workers was checked.

3.3.1. For drilling holes to improve the anchor straps have also been marked. Strong binders can correct brackets and can verify their level. The batch will also be welded at the right angle. The next is mounting the main bracket and counterweight rail. The first thing is, dynabolt to tie brackets was installed where the beam ring was made from the concrete material. Rail holder brackets will be welding against supports that have been installed on the ring beams.

Photo 2.9: Mounting main bracket and counterweight rail process

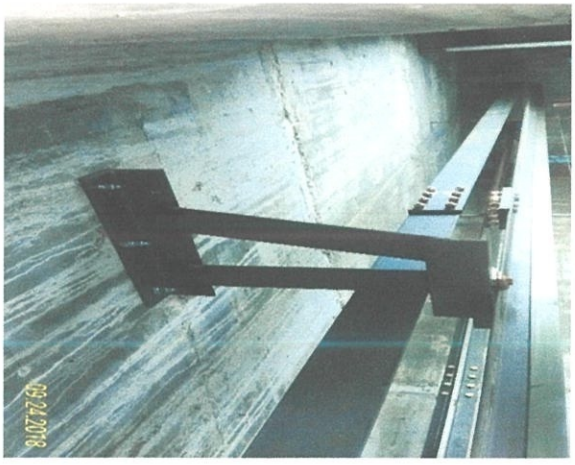


Photo 3.0: Brackets

3.3.2. Installation of car and counterweight guide rails.

On base shaft, guide rails have been placed. The car and counterweight guide rail have been placed parallel. This is also to ensure no side movements occur in the rail.For car and counterweight frame installation, all car body objects are placed on the top floor and placed near the shaft. All the scaffolding was removed. Raise the assembly of the load down and place in the center of the guides. All sling is placed once and closed with bolts and nuts.The diagonal should be checked and adjusted according to the required amount. The shoe assembly assembly was installed at the top and bottom lift sling assembly and locked centrally. There shall be no rotation in the shoes' fixings. Safety gear will be locked under the end of yoke. While the gap between guide and wedge is checked to ensure uniformity. Wedge will also be able to move freely during speed or emergency situations. Next counterweight frame was moved to bottom landing access. The counterweight frame is also fixed in the guide rail center.

Photo 3.1: Counterweight frame and Guide rail center

3.3.3. For roping (main and overspeed Governor rope)

The governor ropes are installed between the overspeed governor and the tension weight pulley. At this time, rotation should not occur on the ropes when fixing. The lever is connected to activate the safety gear to the car top yoke using the overspeed governor rope. Safety gears will be activated and need to be checked by attracting overspeed gorvenor rope. Whereas, the tension weight pulley should be able to move freely. Main rope will be placed between the car and the counterweight wedges in the upper area by one by one. The rope is sure not to screw. Finally, all retaining clips have been installed and safety pins are already in position.

Photo 3.2: Main ropes

Next to the installation of the car platform and walls, the platform will be increased and will lead to the lowest yoke. By aligning the platform, it will get a proper running clearance. It is in secure little by little with bottom yoke using isolation pads and clamps. All walls are mounted according to the procedure and vertically and according to the predetermined size and the Ceiling is connected to the wall. Use clamps and isolation pads to protect car cabin at the top. The verticality and diaogonals of the car body were inspected too, as the center should be aligned to landing door's center.

3.3.4. Landing door and car door.

At all of the landings, a level line was drawn. Next, The position of sills and header's holes / brackets was recorded and expander bolts were used to fix it. Sill and header were locked and ensure they were affiliated. Next, door panels were installed by lifted through the car and certified their alignment. The process was repeated at all floors. Next, when the car's entrance panels were installed, brackets were base in order to install car door drive. Lastly, sill and header for the car door were protected and ensure the car door panels are aligned.

Photo 3.3: Bottom Surface

3.3.5. Installation of pit equipment

All the components were inspect from damage and the buffers location were marked by layout drawings. Then the buffers was turned on while the limit switch was activated and can operates superficially.

Next for shaft electrification, shaft trunking and it layshaft electrification bundles were installed in trunking. All of the wires was connected at all landing door locks while wiring for the pit stop have been installed and connected. Then the travelling cable was laid while, one at inside the control panel was dismissed and the other at connection box on car top.While wiring from control panel was installed to machinery unit ant the main switch. After all of the bigger equipments were installed, landing call buttons and indicators was installed while the wire are connected. The process are just the same goes to the emergency battery panel and the intercom.

3.3.6. Car interiors and car electrification

Car operating panel was installed by now and all of the wires were terminated. Hand rail's brackets was installed and mounted. Then the junction box was installed on car top. The earth wire and earth bar was connected. Control switches, door operator cables, final limit switch, car operating panel cables and safety gear contact cables.

Photo 3.4: Panels

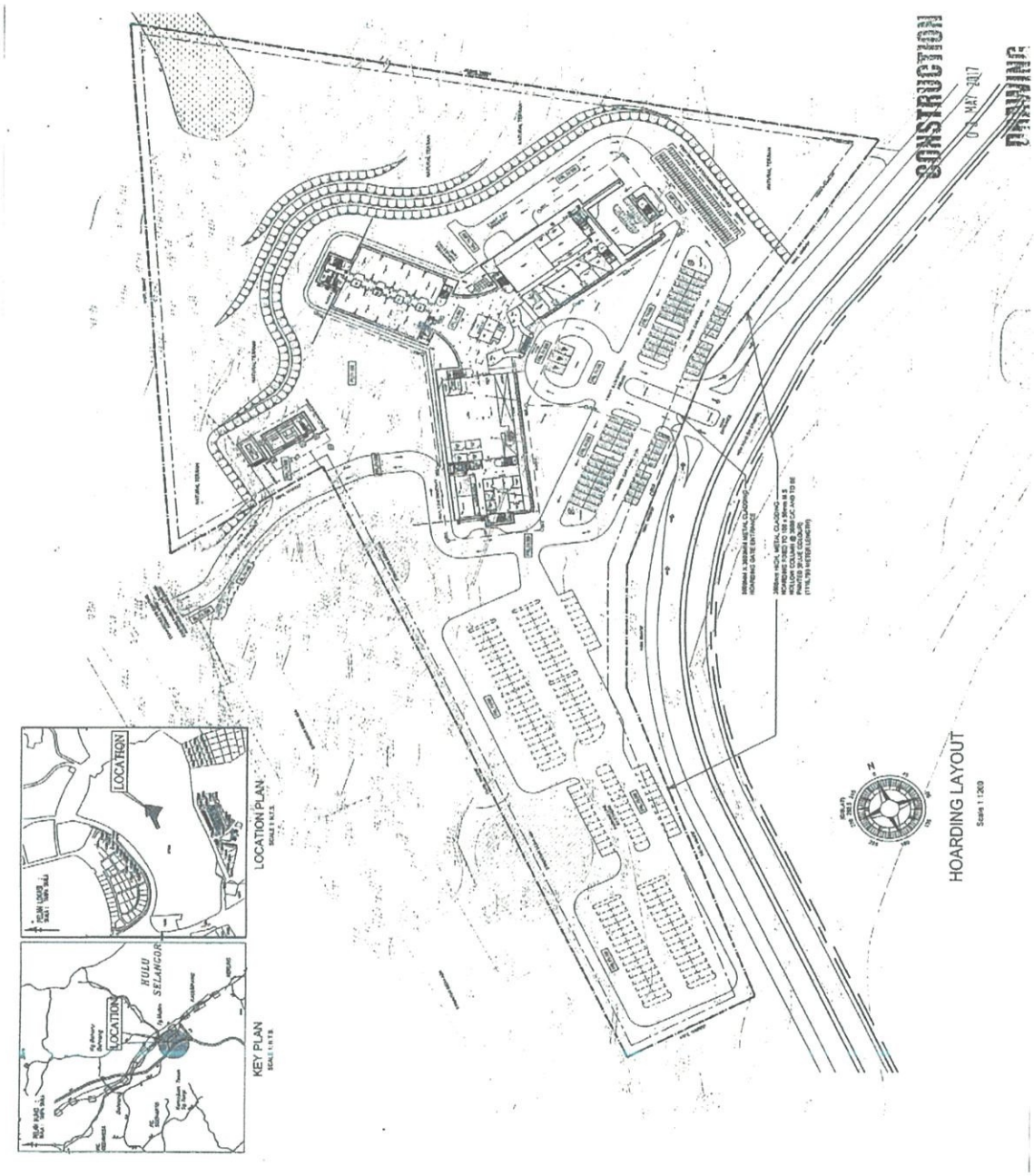
Chapter 4.0

Conclusions.

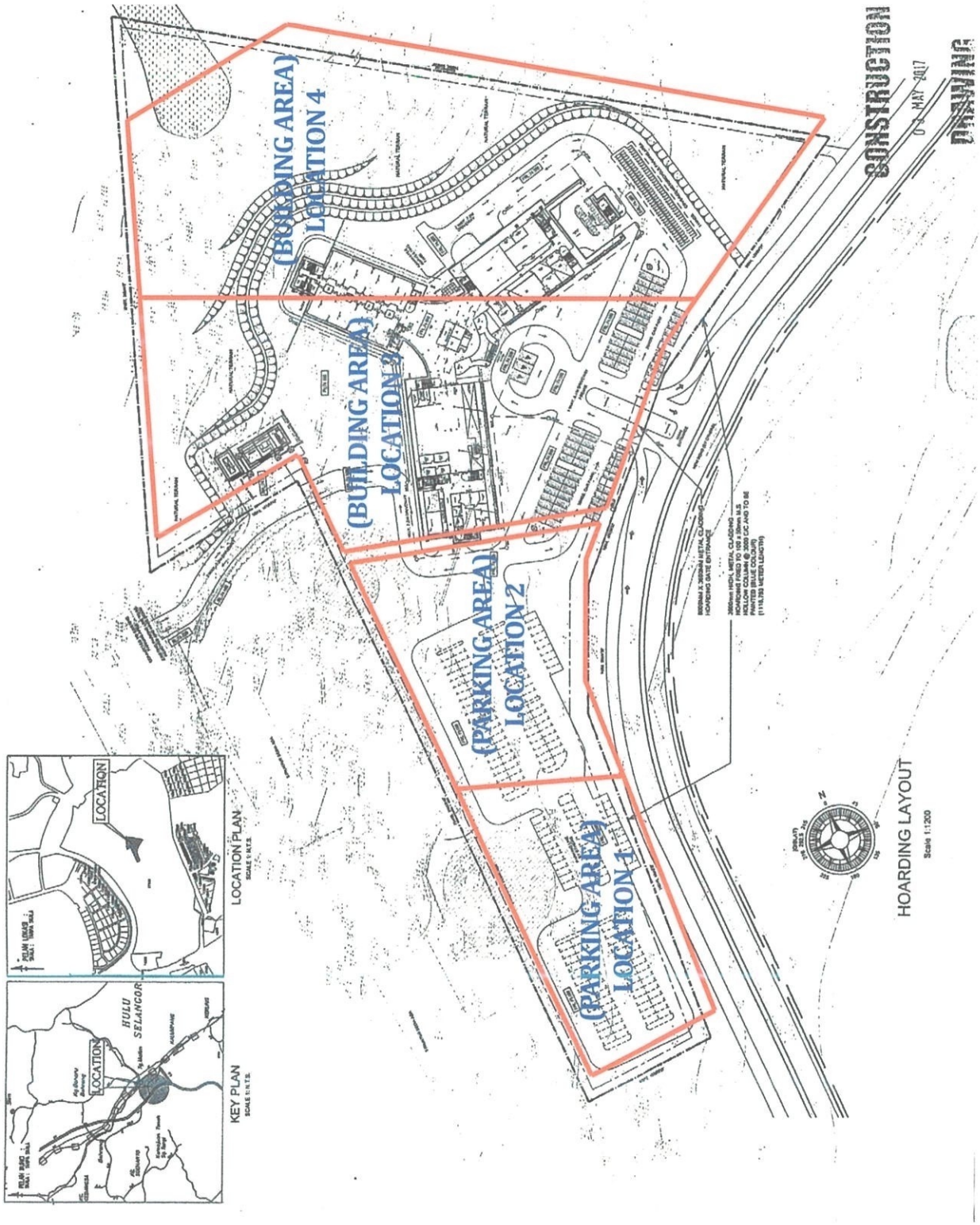
All of the components or system involved played a major role in order to build the lift and make it successfully working. Each of the parts contribute a lot to installation process to create a quality products. For traction system control, the process are actually similar with theoretical. Even though it is quite similar, the process of how its function can only understandable if the real process happened in real life as the theory was a bit difficult to understand. Traction system are more likely faster than other system and can provide smoother and calm rides compare to other system. One of the problem when traction system is used that it required more space. So one of the solutions can be taken is by using machine room less lifts which have been use by this project. There is not much difference between these lifts and the others accept for the size of lift itself. For the installation methods, all of the process were carried out are likely the same.

Appendices

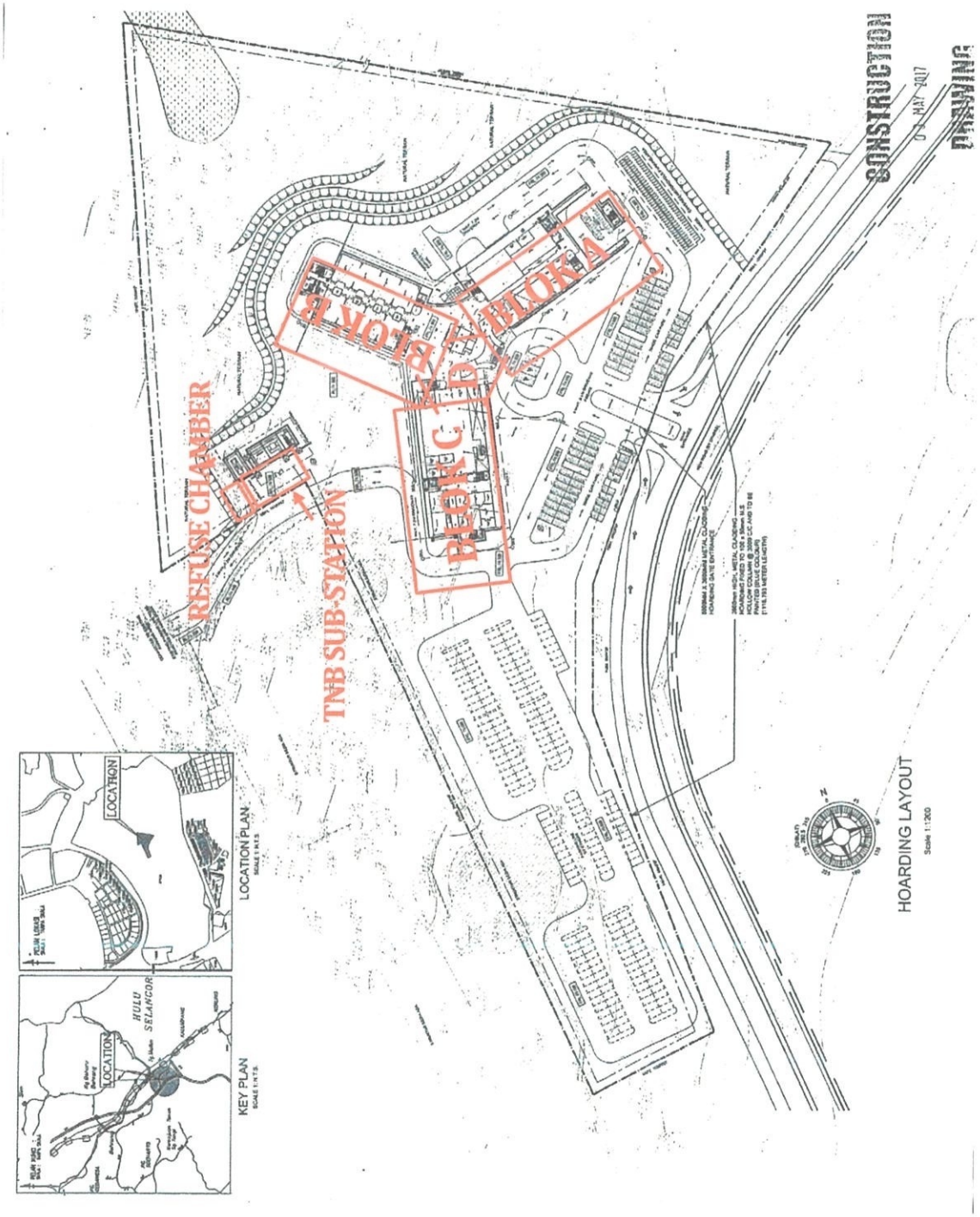
Appendices A.



Appendices B



Appendices C



Appendices D

Appendices E