INDUSTRIAL TRAINING REPORT

YIP WINN SHENG ALWYN

Bachelor (Hons) of Mechanical Engineering

SCHOOL OF ENGINEERING
TAYLOR'S UNIVERSITY

Academic Supervisor

Dr. Koay Seong Chun

March 2020

DECLARATION

I sincerely declare that:

1. I am the sole writer of this report
2. The details of training and experience contain in this report describe my involvement as a trainee in the field of **mechanical and electrical** engineering.
3. All the information contains in this report is certain and correct to the knowledge of the author

Signature : 

Name : Yip Winn Sheng Alwyn

ID No. : 0326644

Date : 28/3/2020

ACKNOWLEDGEMENTS

Throughout these 3 months, I had undergone Internship Training Program at Kejuruteraan Broadway Sdn. Bhd. This company is focused on electrical installation which consist of high-rise buildings, offices, factories, hospitals, sports complex, etc. In addition, this company provides instrumentation, building automation system and installation of electrical power supply like substation and distribution box. I was very fortunate to be given an opportunity to work with so many professionals who led me through this internship period. I have garnered invaluable working experience in a electrical contractor sector.

First and foremost, I would like to express my gratitude to Mr. Kong Hey Wah, my supervisor at Kejuruteraan Broadway Sdn Bhd. Mr Kong gave me very valuable and knowledgeable instructions and gave me extensive guidance regarding many practical issues. His enlightening suggestions and encouragements made my working experience more meaningful.

On the other hand, I would like to extend my appreciation towards Dr Ku Pei Xuan for being my academic supervisor and more importantly for her enthusiastic encouragements and precious instructions during my internship period.

I foresee this opportunity as a big milestone in my career development. I will use my gained skills and knowledge in the best possible way, and I will continue to work on their improvement, in order to attain desired career objectives.

ABSTRACT

The purpose of this internship report was to provide a detailed information regarding my 3 months period of industrial training at Kejuruteraan Broadway Sdn Bhd. In this report, I will elaborate further on the company profile, my working experience and all the knowledge that I have gained during this short period of time. In addition, I will also explain some of the challenges faced and how I overcome it.

First and foremost, the duration of my industrial training was 12 weeks which was adequate to provide an insight into a real working environment setting. This internship has allowed me to develop my soft skills like communication, computing, management and teamwork. Throughout my internship, I have displayed professional work ethics and initiative in doing task that have been assigned to me.

In this company, I was exposed to mechanical and electrical installation for high rise buildings, sports complex, housing and office building. I was able to gain invaluable knowledge in a mechanical and electrical contractor working environment. I was assigned under a supervisor; Mr. Kong and I also assisted a few other site workers throughout my whole internship period. Under Mr Kong, I learned how to calculate tender, draw certain modelling of electric circuit and distribution box, consult the architect to seek for more knowledge regarding the project and many more. All these has certainly opened my eye in an engineering working environment. During the beginning, I was still new to working with Autocad but I have tried to understand and learn the software with my own initiative. This has enabled me to perform my task within the given time.

Overall, this industrial training has been very fruitful and for me as I have gained many invaluable experiences and knowledge. I have made good use of this opportunity by learning a new software, expanding my connections, and also improve my critical thinking skills.

TABLE OF CONTENTS

LIST OF FIGURES

Chapter 1.0 INTRODUCTION

Industrial training is a compulsory module for all engineering students in order to meet the minimum requirement for a Bachelor degree. The main purpose of this industrial training is to allow students a chance to experience a working environment in their specific field. This opportunity also allow student to experience something beyond the in-campus studying experience as the students will be working in a completely different environment. Some may be working in an offshore, office, manufacturing, factory or even an oil plantation. Engineering students will undergo a 12 weeks period of industrial training as it is minimum requirement by the Engineering Accreditation Council (EAC). Students are required to source for a company which is related to the filed of studies. During the internship, each student shall be assigned a industrial and academic supervisor. Students will then be assessed throughout the whole internship by the industrial supervisor. In addition, students will also be graded by relevant documents such as logbook, final report and evaluation form from both academic and industrial supervisors.

1.1 Company's Background

Kejuruteraan Broadway Sdn. Bhd. was founded in 1980. The company originated from a small contracting company since 1980.Under the supervision of the Managing Director and the dedicated staff, the company achieved remarkable success over the years. The company targets are to achieve the highest standards of performance in terms of quality of work, safety, completion according to program and within budget to protect the interest of Sub-Contractors and Suppliers, and to continuously strive for good relations with the public.

Over the years, with the advancement of technology and effective management, Kejuruteraan Broadway Sdn Bhd has established itself as the one of the leading General Electrical and Mechanical Contractor in Malaysia, spanning its services across Malaysia

In order to achieve this, this operational activity is appropriately subdivided in the following different department: -

1. Planning and Design Department

2. Contracts Department

3. Technical Services Department

4. Marketing Department

5. Finance and Administration Department\

Kejuruteraan Broadway Sdn Bhd in Malaysia provides services which covers four main areas, which comprises of:

1. Electrical Installation

For high-rise buildings offices, factories, hospitals, hotels, schools, sport facilities, department stores, supermarkets, airports, aircraft hangers, road, etc.

2. Mechanical Installation

For Air- Conditioning, Plumbing and Fire Fitting Systems.

3. Electrical Power Supply

Installation –

For Power Stations, Sub-Stations, Power Transmission Lines, distribution and communication lines and related engineering works.

4. Instrumentation and Building Automation System.

Kejuruteraan Broadway Sdn. Bhd. involvement in every project includes planning, design, procurement, construction and maintenance has always been highly integrated to establish a comprehensive system which functions effectively and economically for every project. The best technologies are always researched and applied to maximize the returns of the clients. With the introduction of computer-controlled system and the latest technologies, Kejuruteraan Broadway Sdn. Bhd. is now capable of undertaking complete packaging service for major mechanical and electrical contracts.

Kejuruteraan Broad-way Sdn. Bhd. processes the latest information regarding laws, relations and standard concerning design and implementation of projects. They have established systems for design execution and technical services that are adapted to prevailing conditions socially, geographically, climatically or otherwise.

1.2 Aim and Objectives

The company's vision is the deployment of innovative, sustainable and reliable services. In addition, the company's mission is to deliver professional services that have measurable values to all stakeholders.

The Broad-way Group of Companies

- Broadway Engineering Services and Trading Sdn Bhd.
- Broadway Power Sdn Bhd
- Broadway TT Sdn Bhd

Sub-Contractors:

- Albekon Sdn Bhd
- Eco Elite Electrical Engineering
- T & C Electrical Engineering
- Hoong Air-Cond Engineering
- Best-Maker Electrical Engineering
- N.S.S.K. Enterprise

Company Development Timeline

1967 : Broadway and Co were established

1980an: - Kejuruteraan Broadway Sdn Bhd was formed

-Suruhanjaya Tenaga Licensed Obtained

-Actively involved in Residential Housing Project

1990an: -Actively involved in Highrise Condominium, Hotel, Motel

Multi-purposes Hall Project

-Telekom License Obtained

-TNB Vendor License obtained.

2000an: -Actively involved in Factory, Hospital, Hotel, Department Store, Government and 33kV Projects.

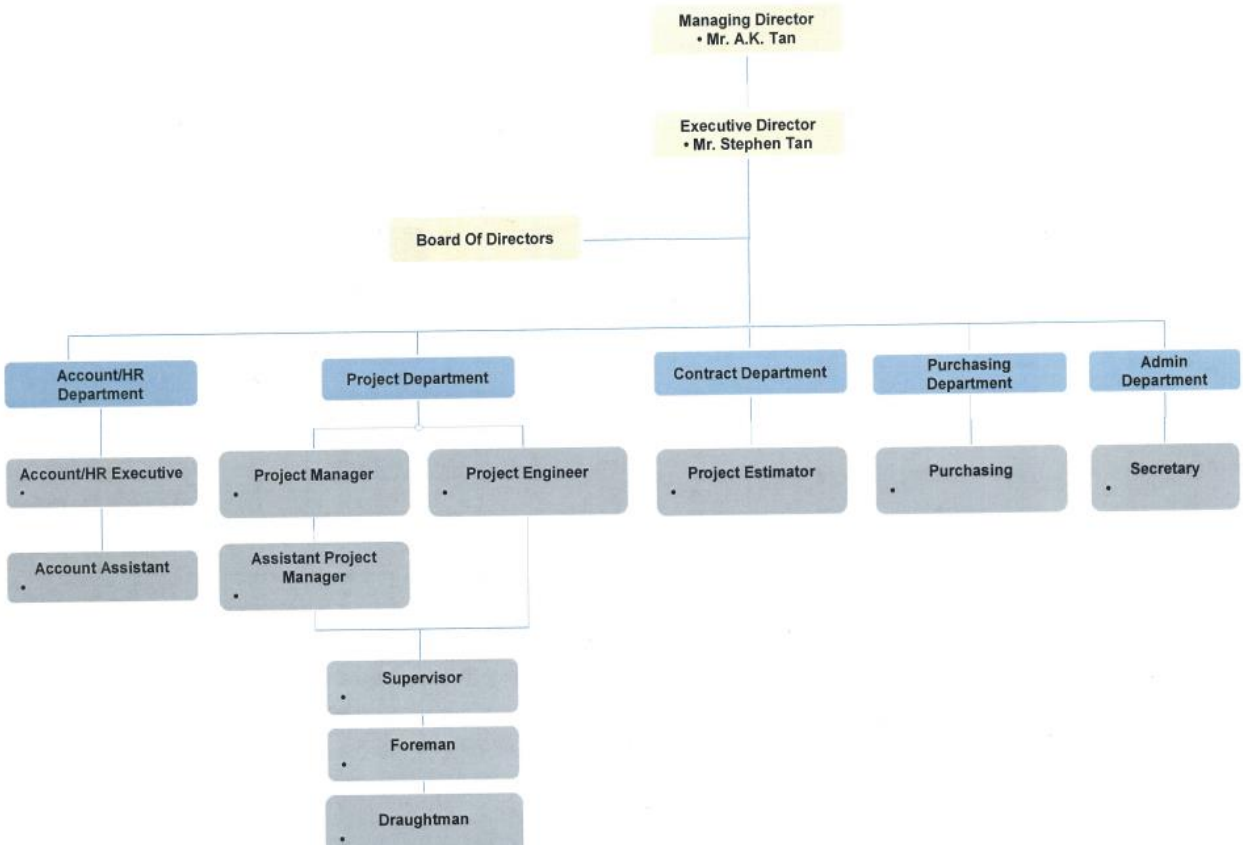
-ISO certificate obtained.

-CIDB License upgraded to G7

Kejuruteraan Broadway Sdn Bhd's blend of experience, technology expertise and skill is coordinated in an integrated approach to the construction and development of electrical installation, air-conditioning, plumbing, instrumentation, and firefighting works for refineries, transmission lines, power stations, factories, commercial buildings, air ports and shipyards. Kejuruteraan Broadway is committed to strive for excellence in our continuous efforts towards upgrading the living environment of the people.

With the increasing demand for power, Kejuruteraan Broadway Sdn Bhd has developed several advanced installation techniques and mechanized its work processes and equipment. Close communication is maintained between each company withing the Group and management and technical expertise is polled on an international basis which would ensure the application of the highest degree of construction management system and construction management system and construction technique regardless of its project nature or locality.

1.3 Organization Chart



ISO 9001:2015 Certified

CORPORATE INFORMATION

Holding Company	:	**Kejuruteraan Broad-Way Sdn Bhd** (Co. No. 53799-X)
Address and Registered Office	:	29, Jalan Jintan, Taman Supreme, Cheras, 56100 Kuala Lumpur, West Malaysia
Telephone Nos.	:	03-91313699/03-91317672/03-91317984
Fax No.	:	03-91319735
Website	:	www.broadway-group.com.my
Email Address	:	k_broadway_sb@yahoo.com
Nature of Business	:	Mechanical and Electrical Contractor
Authorised Capital	:	RM1,000,000.00
Paid-up Capital	:	RM1,000,000.00
Directors	:	Tan Seng Peng (Tan Ah Kai) (Shareholder & Director) Tan Muen Chee (Shareholder & Director) Sum Kwai Hiang (Shareholder & Director) Tan Swan Khian (Shareholder & Director) Tan Swan Sheng (Shareholder)
Bankers	:	M/s United Overseas Bank (M) Bhd 197-199, Jalan Imbi 55100 Kuala Lumpur
Company Secretary & Auditor	:	M/s Y.M. Soo & Co. No. 3-1, & 5-1, Jalan 5/76B Desa Pandan, Jalan Kg. Pandan 55100 Kuala Lumpur
Lawyer	:	M/s K W Teh & Associates
Registration with authorities	:	ISO - Reg No : AJA09/13866 LPIPM (CIDB) - G7 *Kategori* : *B (Pembinaan Bangunan)* : *CE (Pembinaan Kejuruteraan Awam)* : *Me (Mekanikal Dan Elektrikal)* TNB - G7 *(Electrical Vendor)* Suruhanjaya Tenaga - Kelas A *(Electrical Contractor Engineering)* JTM - Tajuk Kepala VIII - 1a, 1b, 1c, 2a & 2b SESB - G7 *(Electrical Vendor)* PTM-MBIPV - Approved Photovoltaic Services Provider

Chapter 2: Cabling

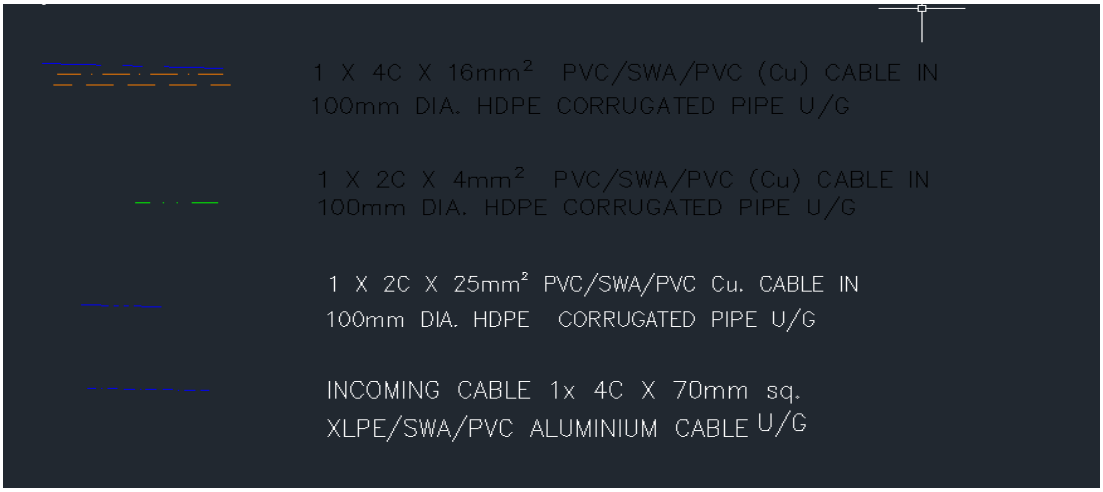


Figure 1 Types of Cabling

Throughout my tenure in this company, I was assigned to draw cables which are laid under the G.I Pipe underground. I was exposed to different types of cables and the compatibility with each situation. XLPE/SWA/PVC" stands for "steel wire armor". "XLPE" at the front means the insulation of the cable conductor. "C" means the number of cores inside the incoming supply cable consist of 4 inner cores each with an electrical insulation. Therefore, each of the four insulated inner cores (the inner core is usually made of either copper or aluminium) is a complete electrical cable by itself.

The cables are bundles together to make it easy to transmit signal and it also reduces cost. On the outer layer of these 4 inner cores, the outer insulation is called the outer sheath. It is made from XLPE which is just like PVC but is slightly more costly and better quality. From the table above, it describes the size of each inner core, the material used underneath the XLPE insulation and the cross-sectional area for the cables. This information is essential as it involves the materials costing and also the sustainability of the cables. ("Network Cable Types and Specifications", 2020)

2.1 Filler

Filler is normally placed to fill up the empty spaces in a multicore cable. In addition, filler also maintain the circular shape of the wire and strengthens the cable. In certain wires, it helps to balance out the electromagnetic fields. Fillers are made from solid plastic, paper, foamed & fibrillated polypropylene, cotton or rayon, and Kelar. **Figure 2** below shows an application of filler in a multicore cable.

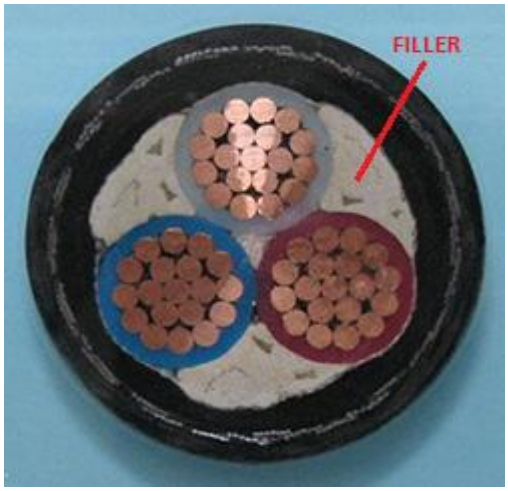


Figure 2 Filler

2.2 Bedding

Bedding is also known as inner sheath or inner jacket which is commonly used in armoured cable. It is located in between insulation and armour and has several functions, such as holding cores and filler in place, act as protective layer to protect insulation from armour, and act as bedding for the armour. It is made of thermoplastic or thermosetting compound.

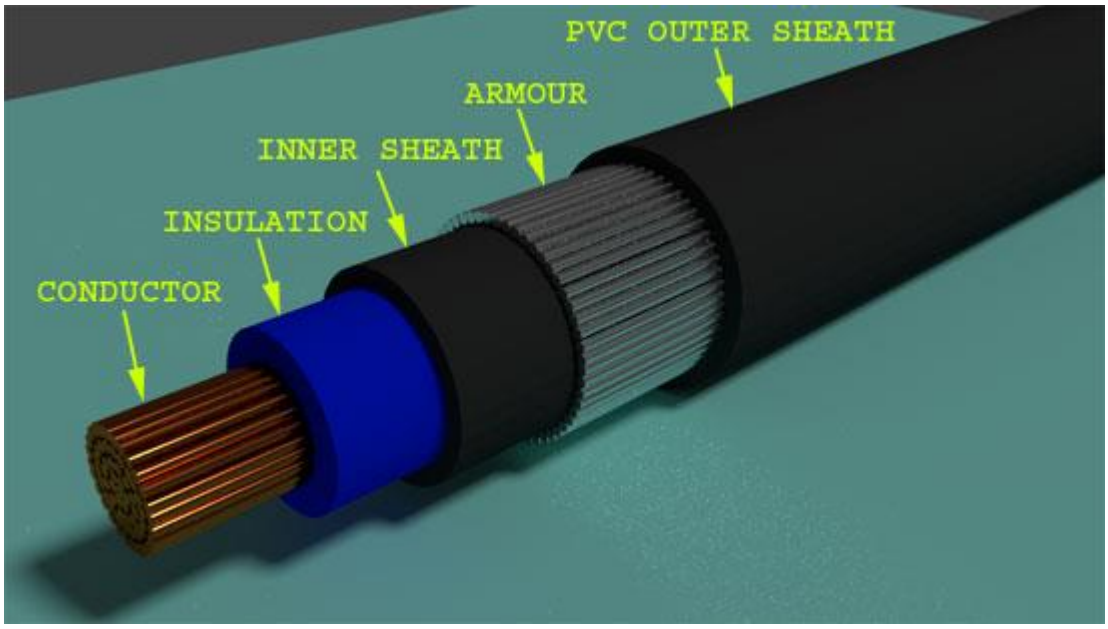


Figure 3 Application of Bedding

2.3 Screen (Individual/Overall)

Screening is also known as shielding. It is normally used in instrument cable. The function is to prevent electromagnetic field interference from surrounding. Instrument cable are normally used to carry important data. These data are normally sensitive to noise. Due to this reason, screen is used to protect cable from electromagnetic interference and other type of noise.

Screen are commonly made from copper, steel, and aluminum. There are several types of screen, which is foil, braided, spiral, and combination. **Figure 4** shows difference between each type of screen.

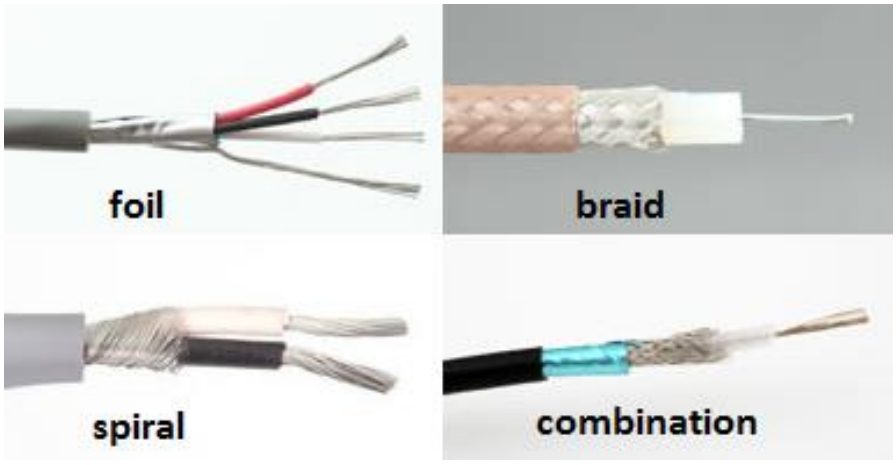


Figure 4 Screen (Individual/Overall)

2.4 Drain Wire

Drain wire is located under screen. It is normally made of copper wire and is connected to earth at end of cable. Its function is to provide a grounding path with lowest resistance. This is due to the screen can be made of different material, such as aluminum and steel. This material may not have resistance low enough to be use as grounding, especially at long distance. Due to this reason, a drain wire is used to drain the noise absorbed by screen. Figure below shows example on application of drain wire.

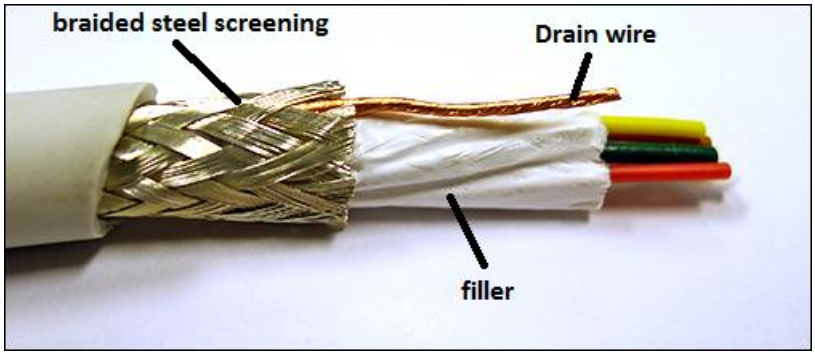


Figure 5 Drain Wire

2.5 Armour

Armour is a protective layer located in between bedding and outer sheath. Its function is to provide mechanical protection so that the wire can sustain high stress. It is normally used in underground cable or undersea cable as this cable will need to withstand high stress all the time. Two types of most used armour is Steel Wire Armoured (SWA) and Aliminum Wire Armoured (AWA). Figure below shows example of application of SWA.

Figure 6 Armour

Chapter 3: AutoCAD Drawing

Figure 7 Shop Drawing

A shop drawing is a drawing sets of drawings produced by the contractor, supplier, manufacturer and subcontractor. Shop drawings are a set of drawings which provide the details of various components that help in construction project. Shop drawings describe how the buildings was originally designed, internally with various MEP components in place with their exact dimensions mentioned. In short, shop drawings are supplement of working drawings

List of Details of Shop Drawings:

1. The date of original issue
2. Revision date
3. Title of Project
4. Project number
5. Main contractor, Supplier, Developer, Mechanical Contractor, Electrical Contractor details
6. Identifications of all materials and products with their dimensions
7. Various components to adjacent materials and structures.

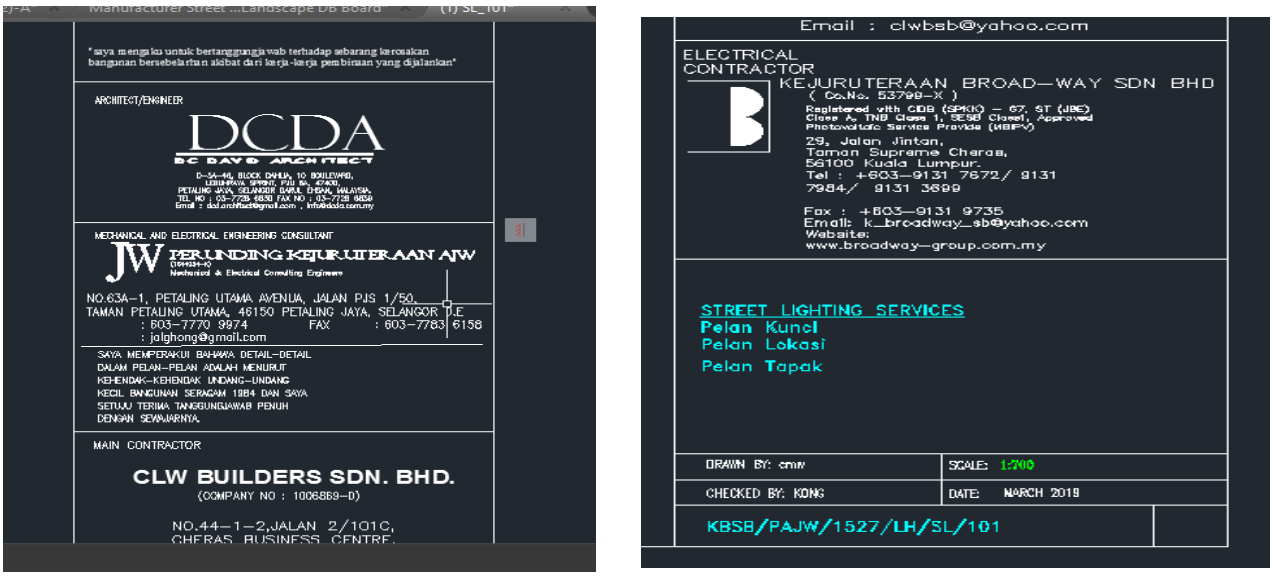


Figure 8 Title Block

3.1 AS Built Drawings

AS built construction documents reflect the actual structure or the building – not as it was originally conceived as idea but as it stands. The AS Built Drawings offers purpose such as insights into safety, facilitate future repairs and renovations, maintenance and operations is a breeze with as-built blueprints. They are a record from which future system changes and/or additions can be designed. Future renovation projects will be more efficient and less disruptive if the as built documents can be depended upon for critical information.

3.2 GI Pipe

I was assigned to design the cabling routes under the G.I pipe. I have learned that there are 2 different type of pipes used in this project.

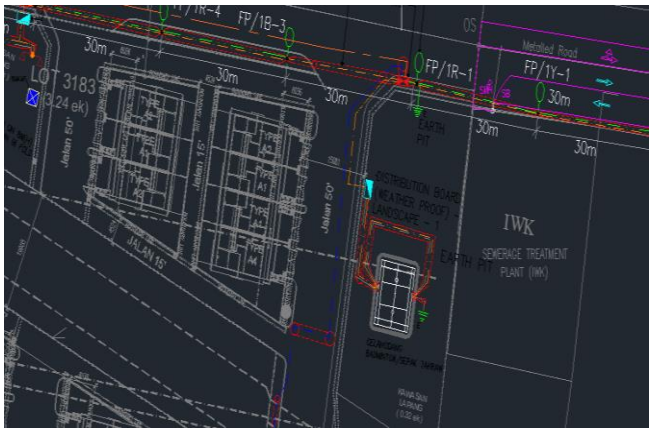


Figure 9.0 Cabling route

Figure 10.0 GI Pipe

Galvanized iron pipes commonly used on water pipelines is dipped into zinc for corrosion protection. These days the pipe will likely be made from steel rather than iron. Galvanized iron pipes are commonly used on water pipelines.

Mild steel is untreated and usually hot or cold rolled or in the case of pipe extruded while molten. Low carbon content and rusts in humid weather and can be bent easier than other steel. Hence, mild steel is the most affordable type of steel.

Mild steel pipe refers to the content of less than 0.25% carbon steel because of its low strength, low hardness and soft. It includes most of the part of ordinary carbon steel and high-quality carbon structural steel, mostly without heat treatment used in engineering structures, some carburizing heat treatment and other mechanical parts required for wear. (Mackey & Flett, 1994)

3.3 Street Lightings

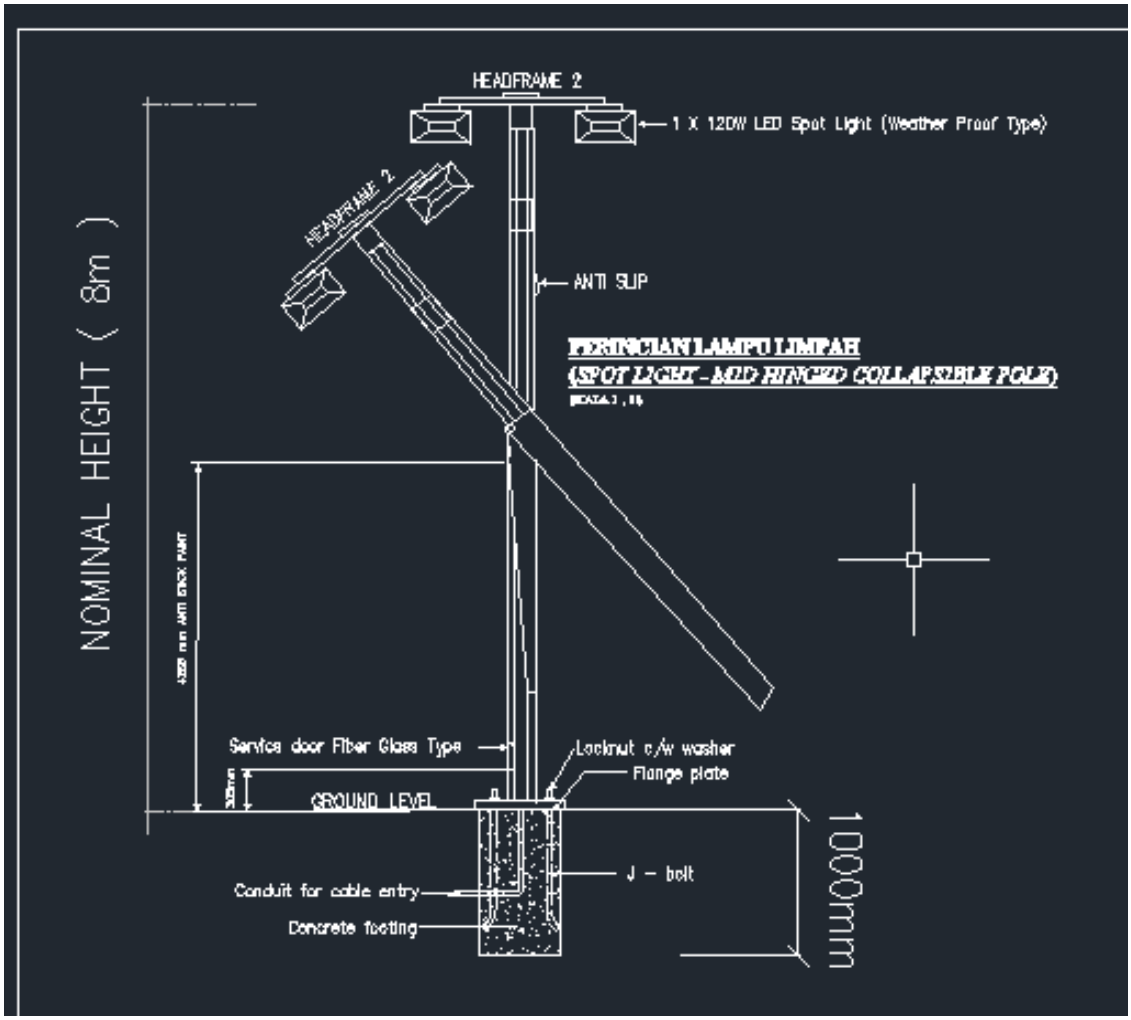


Figure 11.0 Residence Light (NTP Sports Complex)

I was requested to amend the design of the Street lighting poles to comply with the main contractor's requirement. I was requested to change the 8m (height) residence street lighting from Bi-fold type to Mid Hinged Collapsible. The reason for that is that this type of pole is perfect for restricted areas like army camp, prison, offshore wharf, port and others. The applications also extended to recreational sport activity court like tennis and basketball. It has made possible maintenance without lifting machineries. Since, the lighting are requested are to be installed at recreational park. Thus, this type of lighting is suitable.

In addition, I learnt that in our country, there are two common types of Street Lights being used that are Flanged type and Planted type.

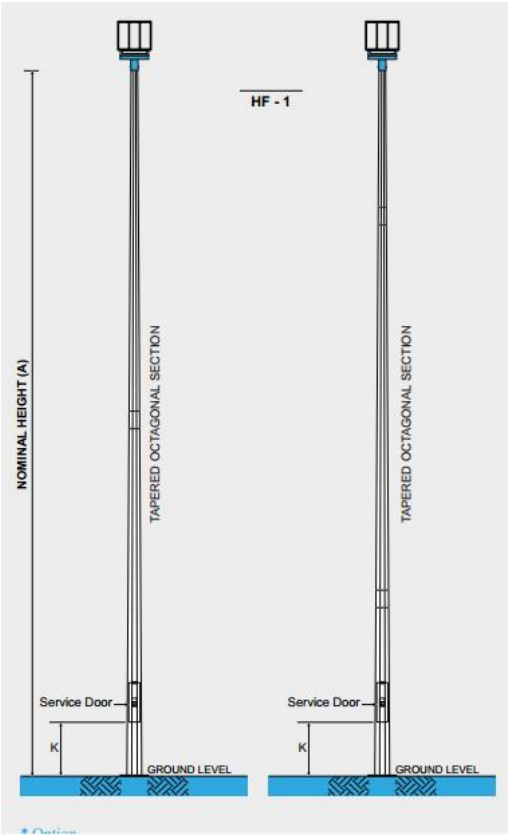


Figure 12.0 Flanged Mounted Type

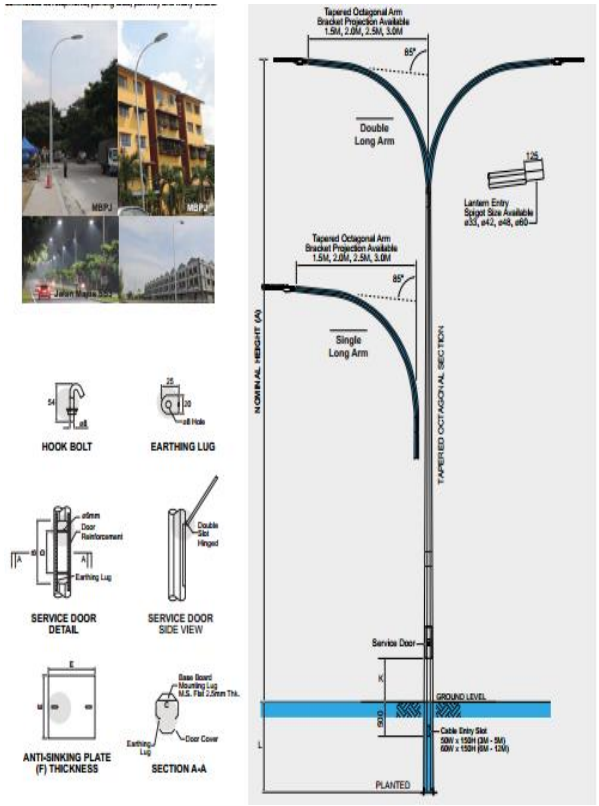


Figure 13.0 Planted Type

Chapter 4: Telephone and ELV Services

I had constructed the Work Progress Claim for NTP World Setapak Sports Complex. I was assigned to visit the site to do a checkup upon completion of task and to identify all the completed task. Upon identifying, I had to take a picture and also include the specification in the Work Progress Claim.

Initially, I was very confused about the work progress claim as I was not sure about the operational and installation at the project site. Hence, I had to contact with the site contractor to understand about the project site and I also referred to the site drawing in order to identify all the items that I was supposed to check. By doing so, I understand more about the project and all the items involved. This task was the most challenging throughout my whole internship.

After the project has commence, it is compulsory for electrical contractor to come out with Work Progress Claim. This is intended to provide the company an update of the progress of the project. After every installation or testing, it will add up to the overall work progress of the item.

This work progress contains the overall cost of the project, the specification of the item, the overall work scope and also the percentage of work done. All are recorded done in order to ensure that the project meets the deadline.

4.1 Telephone Services

The telephone service is receiving the main network service from network provider. The service will be distributed from fiber patch panel to fiber wall socket. The telephone service includes the network data and telephone services. The whole building is linked with network structure and telephone which is connected outside the building with fiber optic Each data point is linked back to patch panel where there is network switch inside the patch panel which have Krones modules for distribution. (Trotter, 2018). **Figure 14** shows the installation of main fiber distribution frame with lightning surge arrestors in the SDF room.

Figure 14 Main Fiber Distribution

4.2 ELV Services

ELV systems for buildings is defined as Mechanical and Electrical (M&E) extra-low voltage System deployed in residential and commercial buildings for the purposes of better control and security. Usually it comprises a variety of sub-systems like: Video Intercom, CCTV, Sensors & Alarm, Vehicle Access Control, Door Access Control, Lift Access Control, Lighting Control, HVAC Control, Public Address Broadcasting, Tour Guard Patrol, Parking Management, etc. ("ELV Services System", 2020)

I have learned about the mechanism of the vehicle counting system. Vehicle counting system is commonly used in most shopping malls, offices or service buildings. This system sends all the data to a user specified remote control center in both wired and wireless fashion. By using this system, it can solve traffic congestion in the parking lot.

The vehicle counter will be placed at strategic location when the incoming and outgoing cars are located. The counter will then be reflected on the indoor display which tells the user how many parking lots are available.

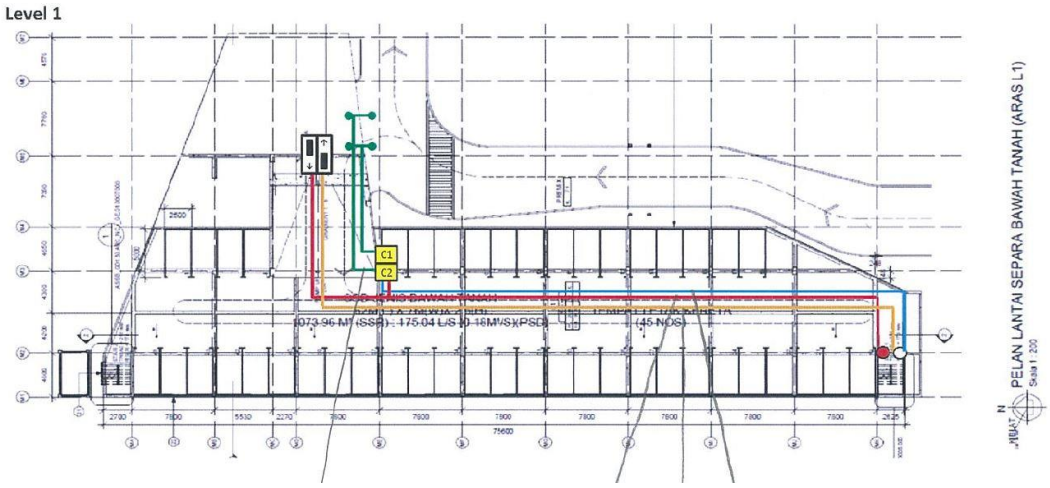


Figure 15 Schematic diagram of VCS

The diagram shows the connection line of the master line, signage line, sensor line and the power source which is also connected to the distribution box.

Figure 16 Vehicle Counter Display

4.3 SMATV system

SMATV stands for Satellite Master Antenna Television and refers to a system that uses multiple satellite and broadcast signals to create a single integrated cable signal for distribution to a cabling network. It often describes as a community Distribution system for channels received from a variety of satellites along with Terrestrial signals & Radio. All these receptions will be combined with the help of “MULTISWITCH”

and distributed with an individual and separate cable to each household in the community building. The size of the network varies small to large. The main benefit of the SMATV is, all homes or tenants in the building can share the installed satellite antenna, no need to have a separate one for each user. Additionally, when there is any new channels available in the connected satellites the subscriber can tune himself no need to purchase new equipment where in CATV required huge investment, with technical expertise to add the new channels. (Seseña et al., 1997)

Figure 17 SMATV application

4.4 Public Address (PA) System

A public address system: (PA system) is an electronic sound amplification and distribution system with a microphone, amplifier and loudspeakers which is used to allow a person to address a large public. The term is also used for systems which may additionally have a mixing console, and amplifiers and loudspeakers suitable for music as well as speech, used to reinforce a sound source, such as recorded music or a person giving a speech or distributing the sound throughout a venue or building.

Public address systems consist of input sources, amplifiers, control and monitoring equipment, and loudspeakers. The primary input sources are microphones for live announcements and a source of recorded sound. It is a system which allows operators, or automated equipment, to select from several standard pre-recorded messages. These input sources are fed into preamplifiers and signal routers that determine the zones to which the audio signal is fed. The preamplifier signals are then passed into the amplifiers.

Figure 18 Types of Speaker

4.5 CCTV System

Closed-circuit television (CCTV is the usage of video cameras to transmit a signal to a specific place, on a limited set of monitors. It differs from broadcast television in that the signal is not openly transmitted, though it may employ point to point (P2P), point to multipoint (P2MP), or mesh wired or wireless links. Although most video cameras fit this definition, the term is most often applied to those used for surveillance in areas that may need monitoring such as banks, stores, and other areas where security is needed. There are several types of CCTV used in the NTP Sports Complex, they are: Analogue Based CCTV and IP Based CCTV.

Figure 19 Bullet Camera

Figure 20 Dome Camera

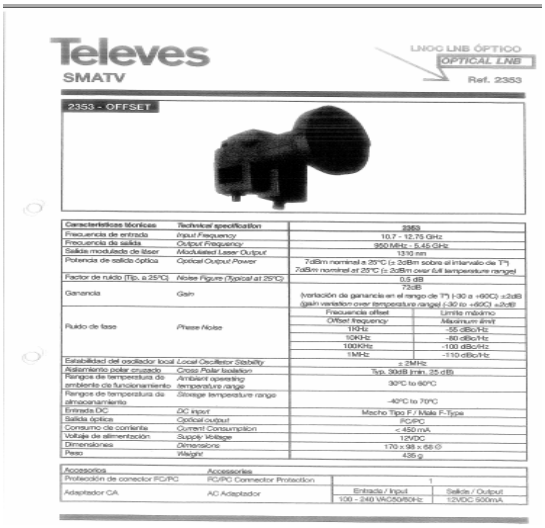
I have learnt that a modern analogue CCTV send their video in the traditional base band format over coax or UTP cabling back to a digital video recorder (DVR). Here, video is digitized and stored on hard drives. Most modern DVRs are a network device, and as such can be accessed remotely from the LAN, or with the proper configuration, from across a WAN or the internet. There are no tapes to change. Video is kept on hard drives, typically on a FIFO basis so there is always a rolling video archive of the past X days. Although the video is being transmitted from the cameras in an analog format, live and recorded video is still available over the network. Analogue CCTV has the price factors advantages. (P. A, 2018)

On the other hand, IP video cameras broadcast their video as a digital stream over an IP network. Like an analog system, video is recorded on hard drives, but since the video is an IP stream straight from the camera, there is more flexibility as to how and where that video is recorded. The DVR is replaced with an NVR (network video recorder), which in some cases is just software since it doesn't need to convert analog to digital. Video footage can then be stored on new or existing network RAID drives as directed by the NVR software. The resolution and wireless system are the benefits of IP CCTV.

I also prepared Operational and Manual which provides catalogue of materials, warranty certificates and AS Built Drawings and learn through the process of it. This is intended to provide the user with enough information to enable them to perform any tasks necessary to maintain or repair any of the systems installed. Covered within this manual is the work carried out as the contract between the contractor and electrical sub-contractor.

As this manual consists largely of manufacturer supplied installation, operation and maintenance booklets and manuals, and excerpts from supplier categories, the pages are not numbered sequentially as this would cause confusion when referring to a manual or catalogue index which list page number specific to itself.

Usually the service manual will detail full and intermediate service. The service manual is stamped by the approved garage when a service is undertaken. The service will ensure the owner or user continues to enjoy the benefits of the warranty offered by the manufacturer. The O&M manual also comprises of AS Built Drawing.



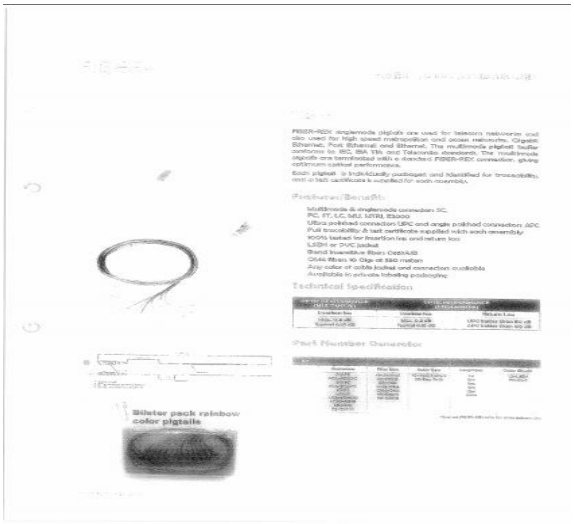


Figure 21 SMATV System **Figure 22 Fiber Rex**

Figure 23 Amperes (Timer Programmer)

Figure 24 IP CCTV (4mm Bullet Camera Fix Lens)

4.6 Distribution Board

A distribution board (DB) serves as an electrical power source from within the building. The main supply cables connect into the DB which will then be distributed to the breakers and to all the circuits, example, lights, socket, plug etc. The DB normally contains the contact breakers and the earth leakage unit.

I have learned that the DB is mounted with pre-fitted clip tray with miniature circuit breaker. The purpose of MCB is to auto switch off when an abnormal of networks has been overloaded or in a faulty condition. MCB is proven to be safer than a regular fuse. Restoration can be done easily by just switching it ON.

The main distribution board is usually placed around 1.8m to 2m in a room where the main electrical cable enters and smaller boards with the contact breakers and earth leakage units are at other points, such as swimming pool pumps, gate motors and outbuildings. There are a few types of distribution boards available in the market such as flush mounted, floor standing, or surface mounted with a closing door or see through plastic covers which is available in different sizes. The sizes are determined by the quantity of circuit rewired within the board to which some manufacturers refer to as modules and others as “way”.

I was assigned to go NTP Sports Complex to identify the different types of distribution board and the sub distribution board. After identifying them, I had to write down the specification of each DB and SDB in the work progress report and update the progress of each DB and SDB.

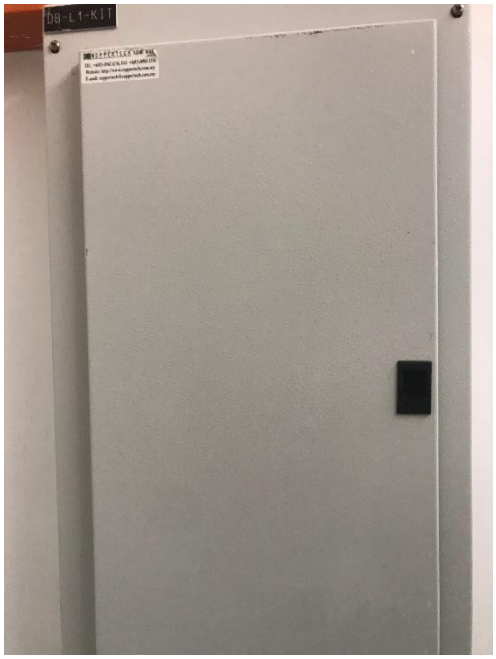


Figure 25 Distribution Box

Chapter 5: Site Visit

During my internship period, I was fortunate enough to have the opportunity to accompany my supervisor for site visit at NTP Setapak Sports Complex. The site supervisor, Ah Keong led me around the sports complex to brief me about the function and operation of the LV Switch room. In addition, I was also lucky to watch the installation of the GENset which comprise the motor and an alternator. It consists of a huge generator which comes through combustion in engine with the help of an alternator and output power supply. The LV switch room was divided into Landlords and Tenants. The main incoming circuit breaker (ACB/MCCB) acts for overloading and fault protection to the whole installation.

Figure 27 Tenant Main Switchboard

Figure 28 Landlord Main Switchboard

5.1 Genset

Figure 29 Genset

I learned that this generator was used to provide most of the energy used by the building during peak usage hours. Gensets are often used in developing areas and other areas which are not connected to the power grid. Places where power outages are very frequent which can cause especially dangerous problems such as in a mine. The operation of a genset is the combination of a prime mover namely the engine and an alternator. The engine converts the chemical energy of the fuel into mechanical energy. The produced energy will then be used to spin the alternator rotor, which converts mechanical energy into electrical energy. The alternator consists of two main parts, a rotor and stator. By spinning the alternator rotor through the magnetic field, the stators create a voltage on the alternator stator by electromagnetic induction. As the voltage on the stator is connected to a load, electric current flows. Hence, the generator produces power.

According to the supervisor, Genset is use as it is more reliable and fuel efficient. In addition, a genset is placed in a soundproof enclosure which can reduce noise in the surrounding areas. The enclosure is made from steal, stainless steel or aluminum. The cabin must also be able to withstand corrosion and have a engine cooling process.

5.2 Lightning Protection system

I accompanied my supervisor to check on the lightning protection system which was located on the high ground. He explained the purpose of this system is to route the electrical energy from the lightning to a less destructive path which is the ground. This system prevents the lightning from striking the building's electrical wiring, water piping, low voltage cabling or structure as it can cause severe damages to the structure. This system does not completely eliminate the damage that can be caused by lightning, but it can reduce the damage by routing the energy to the ground. (Varghese, 2015)

The materials of these lightning protection are mainly copper, copper alloys such as brass and bronze and aluminum. This material is the most suitable for current travelling and weathering.

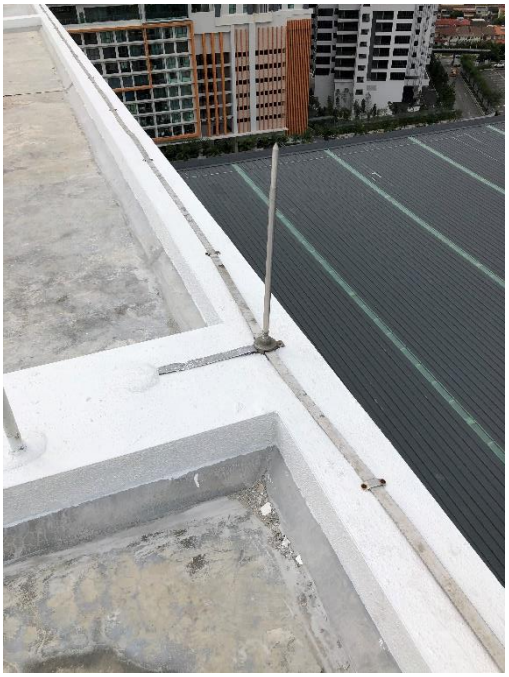


Figure 30 Air terminal on the rooftop

Figure 31 Copper Tape installation

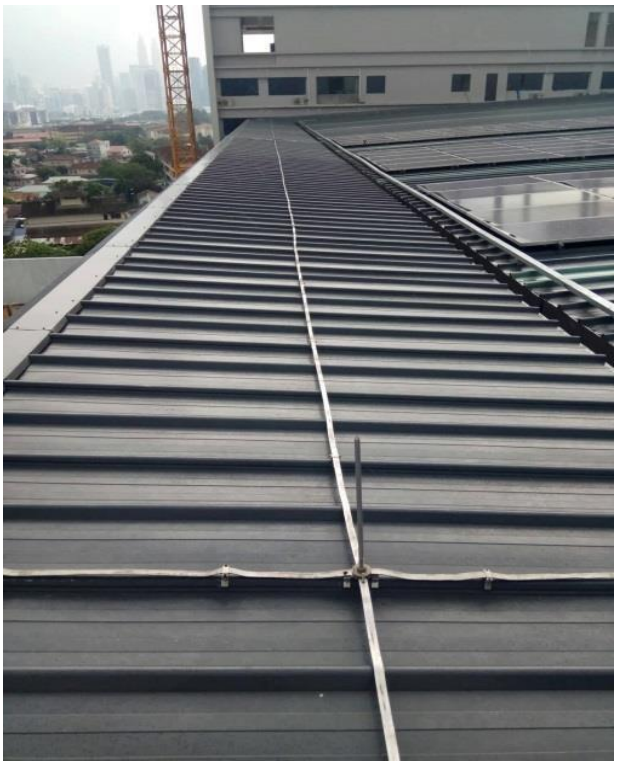


Figure 32 Air Terminal on the rooftop

AREAS OF IMPROVEMENT

There are a few areas that can be improved to produce an effective and fruitful internship training. First and foremost, Taylor's University should study the company background to ensure that the company listed is able to provide a conducive working environment for the student. In addition, the internship could also be prolonged to 6 months instead of 12 weeks to allow the student to adapt to the working environment of the company, develop skills and understand the operational services of the company. The internship should also be held towards the end of the degree as it will be more feasible for employers to hire interns who has the potential to excel in the company.

Secondly, I was assigned under one supervisor and he was the only superior in the office. This is due to the lack of workforce in the company as they were heavily relying on one supervisor and a group of interns. We have to deal with demanding contractors and clients and at the same time we as interns were also adapting to the new working environment. As a result, this may reduce the productivity and motivation of the staff. Hence, it is vital to organize a meeting among superior and subordinates to discuss and have a better understanding on the distribution of task and also workload of each staff.

Besides, the company's network system has always been inconsistent whereby sometimes desktops and laptops can be disconnected while doing work. This occurs as a result of the expansion of the office. As a result, all the staff can't access to the company's network and prepare important documents for tender or submission. This will affect the productivity of the staff. Hence, the company should address this issue by forming an IT helpdesk which is able to provide in time support whenever in need.

In addition, the company should provide an outline and learning outcome for every intern. The company is responsible for ensuring that every intern is able to contribute to the company. By having a learning outcome, the interns are able to gain more knowledge while being assigned to challenging task. This will make this industrial training more effective.

Lastly, this industrial training can be further enhanced by allowing students to experience more hands-on work. However, it is understood by the law that one must require a green card before they can be at the construction site to oversee or do any work. This will allow students to feel the responsibilities of being a site engineer at a real construction site. Students will be able to learn the basic standard operation procedure and also learn to oversee the progress of the project as time goes by.

Conclusion

Overall, my internship experience at Kejuruteraan Broadway Sdn Bhd was a fruitful and good experience. This company was very eye opening considering that it was a small contractor company. The projects that was undertaken by this company is relatively huge and all the staffs have to put in extra effort to meet the requirement of the clients. When I went to work on the first day, I was greeted by the staffs and they have shown me around and also taught me valuable knowledge to work in this company. I was immediately handed a few projects which made me shoulder a huge responsibility. I was mostly required to help my supervisor to draw in Autocad as my supervisor does not know how to operate the software. From there, I learned to pickup a new software within the first week and tried to learn as much as possible. Over time, I managed to discover new features in the software which is able to complete the task given to me. In addition, I was also given the opportunity to follow my supervisor to meetings and also site visits. This has allowed me to witness how does engineer communicate in terms of discussing and suggesting ideas. I was also fortunate to be given task which requires me to visit the site and to oversee the completed task and to report it to my supervisor. I was also assigned to record all the completed task in the work progress report and also take pictures to identify the specification of the items. This task requires me to be more initiative and do research by looking at manuals and shop drawings. Besides that, I was assigned to help calculate the tender for certain projects. This has allowed me to communicate with suppliers to quote prices for materials used by the company. It has improved my communication skills when dealing with suppliers, contractor and engineers. In conclusion, I am very fortunate to be able to improve my soft skills, building network relations and also learn to be more initiative when it comes to learning new skills or knowledge.

References

1. Seseña, J., Prieto, H., & Molina, A. (2017). SMATV networks ready for the introduction of digital TV. *European Transactions On Telecommunications*, *8*(4), 359-368. https://doi.org/10.1002/ett.4460080409

2. P. A, R. (2018). IOT Based Surveillance System for CCTV. *International Journal For Research In Applied Science And Engineering Technology*, *6*(3), 959-963. https://doi.org/10.22214/ijraset.2018.3153

3. Trotter, S. (2018). The demand for telephone services. *Applied Economics*, *28*(2), 175-184. https://doi.org/10.1080/000368496328803

4. Varghese, S. (2015). Practical Approach on Lightning and Grounding Protection System. *International Journal Of Engineering Research*, *4*(4), 192-196. https://doi.org/10.17950/ijer/v4s4/406

5. *ELV Services System*. Syscom.my. (2020). Retrieved 28 March 2020, from https://www.syscom.my/ELV-Services-System.

6. *Network Cable Types and Specifications*. ComputerNetworkingNotes. (2020). Retrieved 28 March 2020, from https://www.computernetworkingnotes.com/networking-tutorials/network-cable-types-and-specifications.html.