PROGRAMME IN BUILDING SURVEYING
DEPARTMENT OF BUILT ENVIRONMENT STUDIES AND TECHNOLOGY
FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING
UNIVERSITI TEKNOLOGI MARA
PERAK BRANCH
SERI ISKANDAR CAMPUS

HANDLING THE PROCESS OF INSTALLATION, TESTING AND COMMISSIONING OF THE EXTRA LOW VOLTAGE (ELV) – ACCESS CONTROL SYSTEM AT MANUFACTURING INDUSTRIES, BATU KAWAN, PENANG

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(2018694844)

Bachelor of Building Surveying (Hons.)

PRACTICAL TRAINING REPORT

Jan 2022

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Jan 2022

Practical Training Report is Fulfilment of The Practical Training Course

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DATE   : JANUARY 2022

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DATE   : JANUARY 2022

ACKNOWLEDGEMENT

بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

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INTRODUCTION

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Figure 1. 1: Radical Internetwork Company Logo's and Certificate's

Radical Internetwork Sdn Bhd (RISB) was established in 2010, have always been one of the top design and build network solutions providers in Malaysia. With professional certification, license and insurance, RISB specialise in virtually every aspect of communications infrastructure and management service, from structured cabling systems to ELV (Extra Low Voltage). RISB clients' range from small to medium enterprises to nationally based corporations and institutions from different industries.

Many of our clients have continued to support us since we first started out. We assist small to medium enterprises, large corporations, various government departments and nationally based corporations and institutions. We pride ourselves in our commitment to excellence in delivering trustworthy and high-quality solutions for all your communication needs. RISB is a registered G5 company under the Construction Industry Development Board (CIDB) and also ISO 9001:2015 certified

Most of our clients are mostly System Integrators, IT Solutions Consultants, Building and M&E Consultants as well as Computer Retailers who are looking for a professional cabling contractor for their projects.

RISB undertakes first-time installations, upgrades to existing installations, and also ongoing maintenance, where we assist our customers with adds, moves and changes to their communications infrastructure. All of our installations are pro-actively managed and overseen by at least one operations manager and a project leader or team leader. These experienced operational personnel not only provide our customers with project feedback, but they also take responsibility for delivering all project-related documentation and warranties.

With a commitment to excellence and reputation for quality, our experts have the ability and expertise to assist you with the design and installation of your Data, Voice, Fiber-optics, Structured Cabling, Telephone Systems, Audio/Video, Security and Surveillance Networks. We offer a one source solution for all your communication needs.

1.2 SITE AND LOCATION

1.2.1 KEY PLAN
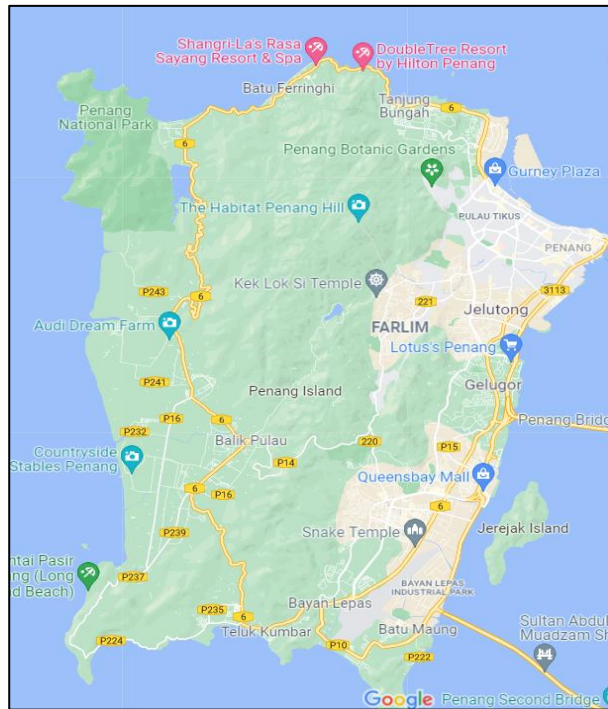
Figure 1. 2: Key Plan - Penang Island

1.2.2 LOCATION PLAN
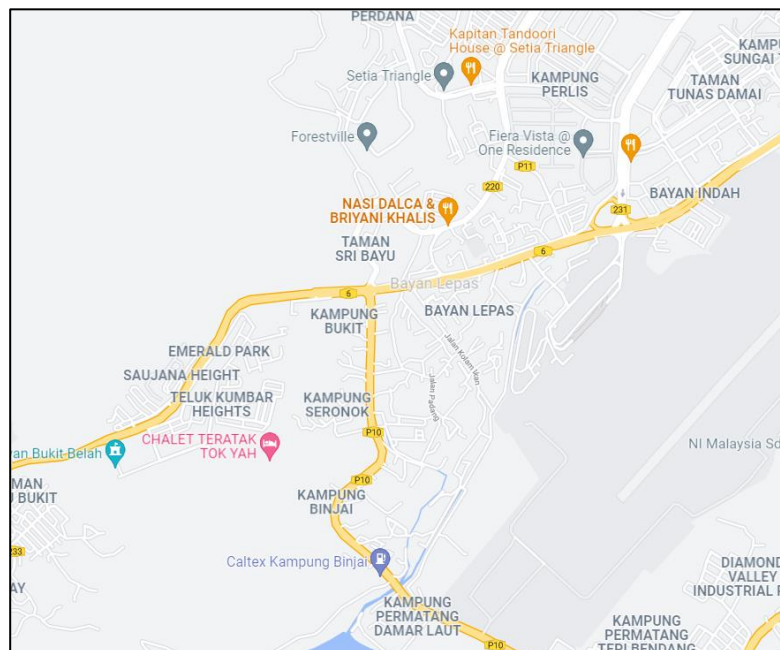
Figure 1. 3: Location Plan - Bayan Lepas

1.2.3 SITE PLAN
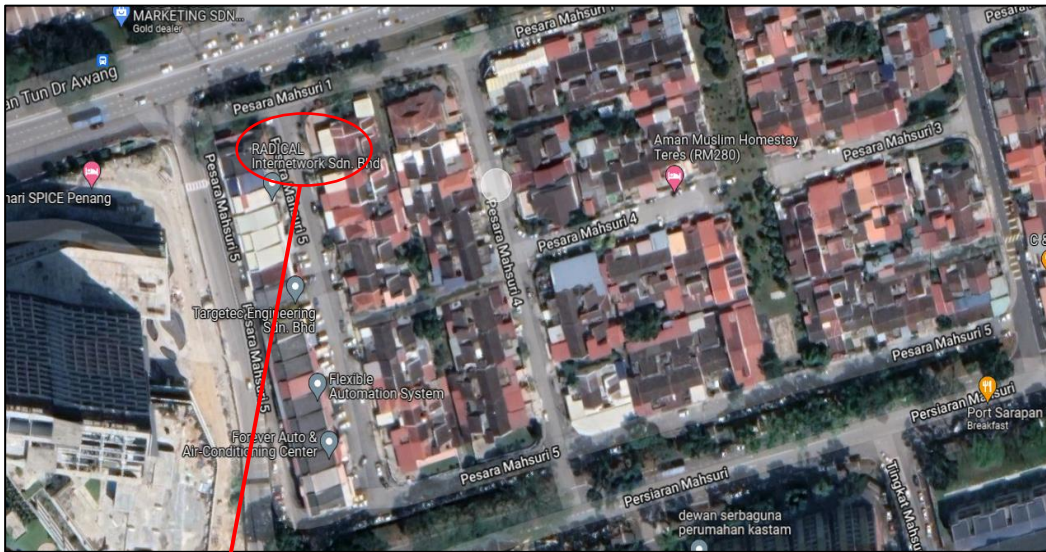
Figure 1. 4: Site Plan – Radical Internetwork

Figure 1. 5: Radical Internetwork Main Office

1.3 COMPANY BRIEF

This company brief is describing the company information.

CIDB Grade:	G5 Registration
Company no:	201001041461 (925389-P)
Category:	B04, CE21, E14, M15
Quality Management system:	ISO 9001 – 12750 ISO 9001 - 1066
Founded:	2010
Headquarters:	Bayan Lepas, Malaysia
Key People:	KM Tan (Managing Director), Felix Tan (Operation Director)
Num. of Employees:	< 50 employees
Website:	https://www.risb.net/
No Tel:	+604 637 0811
Email:	info@risb.net
Area Served:	Malaysia
Services Provided:	Structured Cabling, Extra Low Voltage (ELV), Video Surveillance, Fiber Optics, Energy Management, Cable Management
Vision:	To be a respected design and build network solutions company that delivers.
Mission:	To empower our clients and partners with high-valued products in IT infrastructure, while maintaining our passion and principles as we continue to grow

Table 1. 1: Company's brief

1.4 ORGANIZATION CHART
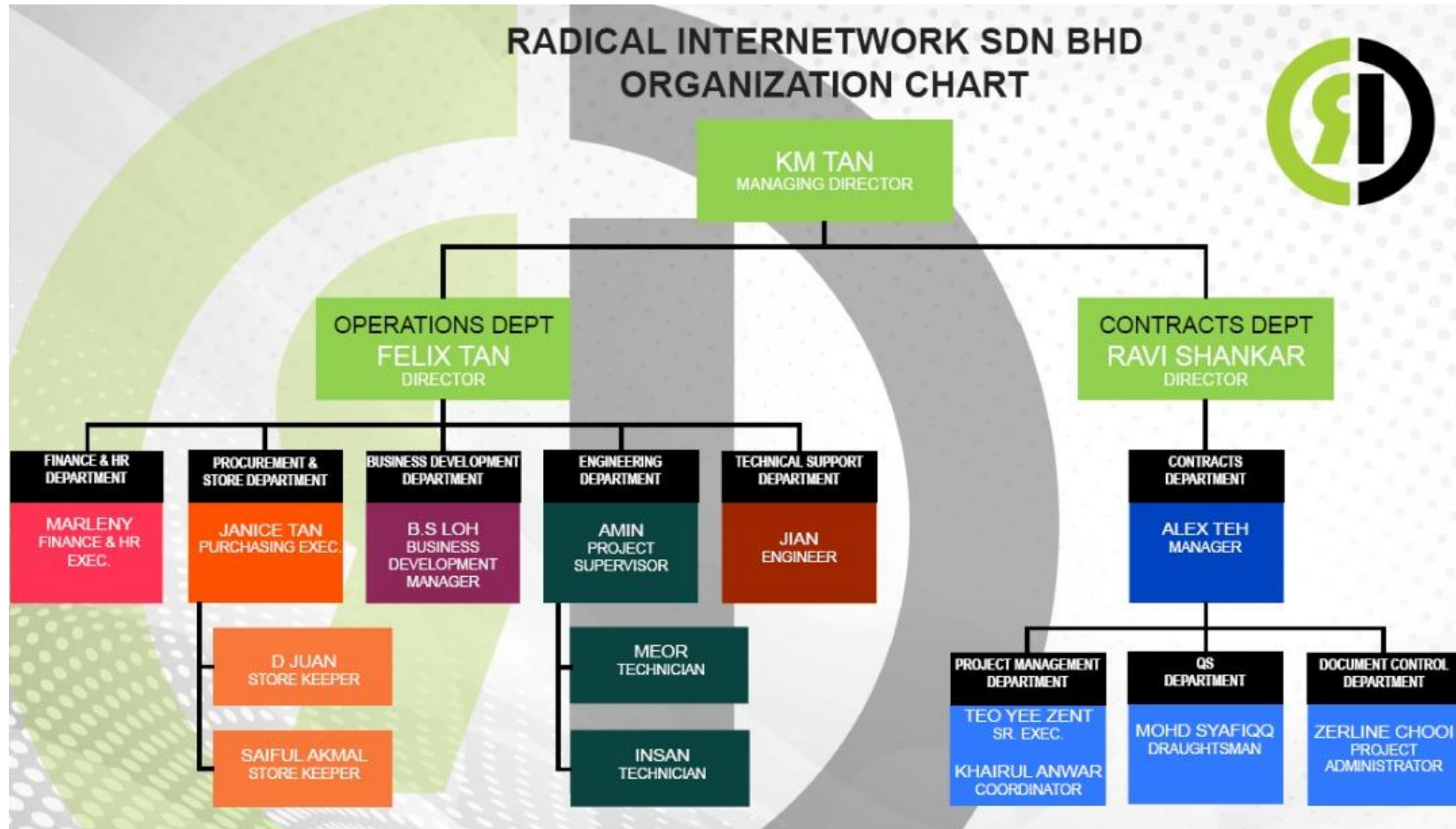
Figure 1. 6: Radical Internetwork Organization Chart's

1.5   TRACK RECORD

We are one of the fast growing and experienced ELV Contractor in Penang. Our directive is to provide quality ELV installation and engineering expertise to the government and private sector. Radical internetwork are specialises in virtually every aspect of communication infrastructure design and installation from CAT5e, CAT6, CAT7, Data Cabling and Fiber Optic to an entire suite of structured cabling redesign and ELV services. We have extensive knowledge and practical experience with industry, developers, and governments.

We're well-equipped to deal with the difficulties of fast evolving technology, increased competition, and shifting economic conditions. We have highly qualified individuals with extensive industry knowledge to handle a variety of project natures.

Structured Cabling System	- Data cabling for Cat5e, Cat6, Cat6A and Cat7 solutions Design, Installation, Testing and Commissioning - Cable Management Works - Maintenance Cabling Works (Move, Add and Changes to existing infrastructures) - Cable Certification Reporting
Fiber Optic Enterprise Network	- Multimode and Singlemode System - Air-Blown Fiber and Microduct Solutions - Complete Fiber Optic Splicing, Interconnect and Cable Management - OLTS and OTDR Fiber Certification Testing
ELV (Extra Low Voltage)	- Network CCTV Cameras and Video Encoders - Security Access Control System - Network LAN/WAN POE Switches/Routers - Public Address System - Digital Communication System - Wireless Connectivity Solutions - SMATV/IPTV Infrastructure

Enclosure, Cabinet and Cable Management	• Complete solution for cabinets and containment systems for data centers, server rooms and office spaces • Cable pathways and wire mesh tray design and installation • Adds and changes to connections for future networking growth and cabling demands
Energy Management System	• Building Automation and Control Systems • Hotel Room Controllers (RCU/GRMS) • Power Management Systems • EV Charging Stations

Table 1. 2: Radical Internetwork Expert

1.5.1 LIST OF PREVIOUS PROJECT

YEAR	PROJECT	SCOPE OF WORK	INDUSTRY
	Teleperformance Bayan Baru, Penang	Supply And Install Structured Cabling for Data and Voice	Corporate Office
	Prince Of Wales Island International School	Supply And Install Structured Cabling for Data and Voice	Educational
	Park Royal Hotel Langkawi, Kedah	Supply And Install Structured Cabling for Data and Voice and ELV System	Hospitality
	Gurney Ascott Hotel, Penang	Nominated Sub Contractor (NSC) For ELV Supply and Install Contract	Hospitality
	Towam Sdn Bhd Batu Kawan, Penang	Supply And Install Structured Cabling for Data and Voice	Manufacturing
	Plexus Manufacturing Sdn Bhd	Supply, Install and Maintenance for Add, Move, Changes to Structured Cabling System	Manufacturing
2020	TF-AMD Penang	Supply, Install and Maintenance for Add, Move, Changes to Structured Cabling System	Manufacturing
	Lumileds, Penang	Supply, Install and Maintenance for Add, Move, Changes to Structured Cabling System	Manufacturing
	Ansell, Kedah	Supply and Install Structured Cabling for Data and Voice	Manufacturing
	TreeO by Hunza High Rise Residential, Penang	Supply & Install FTTH and ELV Equipment	Residential
	Penang Hill (Bukit Bendera P.Pinang	Supply and Install Structured Cabling for Data and Voice	Tourism
	NUR Power, Kulim Kedah	Commissioning and Testing of Fiber Optic Cabling for SCADA	Utilities

YEAR	PROJECT	SCOPE OF WORK	INDUSTRY
2018 – 2019	Teleperformance Bayan Baru, Penang	Supply and Install Structured Cabling for Data and Voice	Corporate Office
	KDU University Batu Kawan, Penang	Nominated Sub Contractor (NSC) for ELV Supply and Install Contract	Educational
	Quay Hotel (The Prestige) Georgetown, Penang	Supply and Install Structured Cabling for Data and Voice Access Control System and CCTV NVR Servers	Hospitality
	Park Royal Hotel Langkawi, Kedah	Nominated Sub Contractor (NSC) for ELV Supply and Install Contract	Hospitality
	VAT Malaysia Sdn Bhd Batu Kawan, Penang	Supply and Install Structured Cabling for Data and Voice	Manufacturing
	Plexus Manufacturing Sdn Bhd	Supply, Install and Maintenance for Add, Move, Changes to Structured Cabling System	Manufacturing
	TF-AMD Penang	Supply, Install and Maintenance for Add, Move, Changes to Structured Cabling System	Manufacturing
	Hospital Pulau Pinang	Supply and Install Structured Cabling for Data, Voice and ELV Systems	Medical
	Hospital Seberang Jaya	Supply and Install Structured Cabling for Data, Voice and ELV Systems	Medical
	Intel KM6 Kulim, Kedah	Supply & Install PA Systems	Semiconductors

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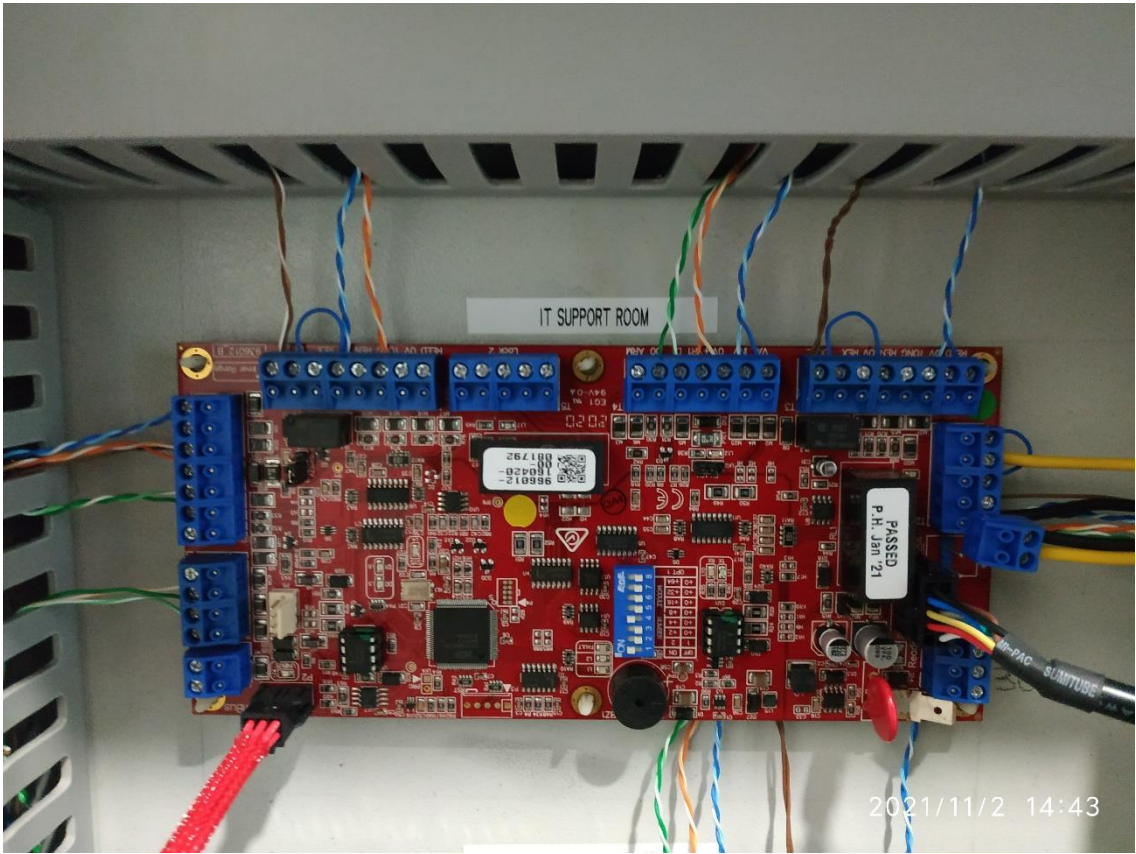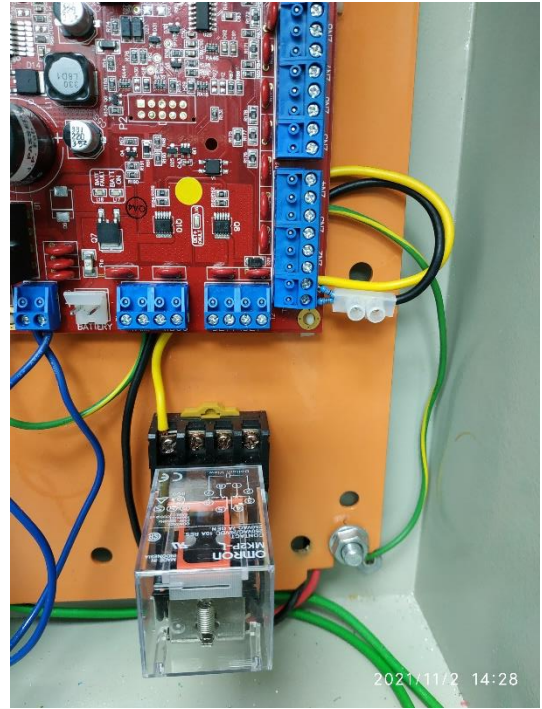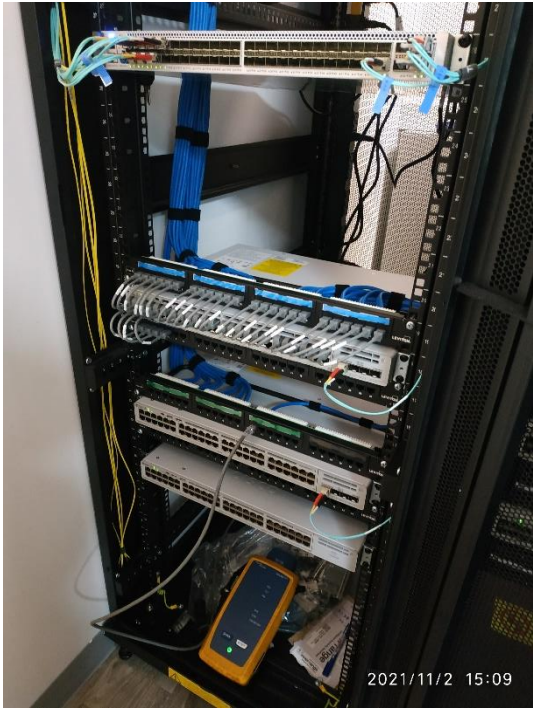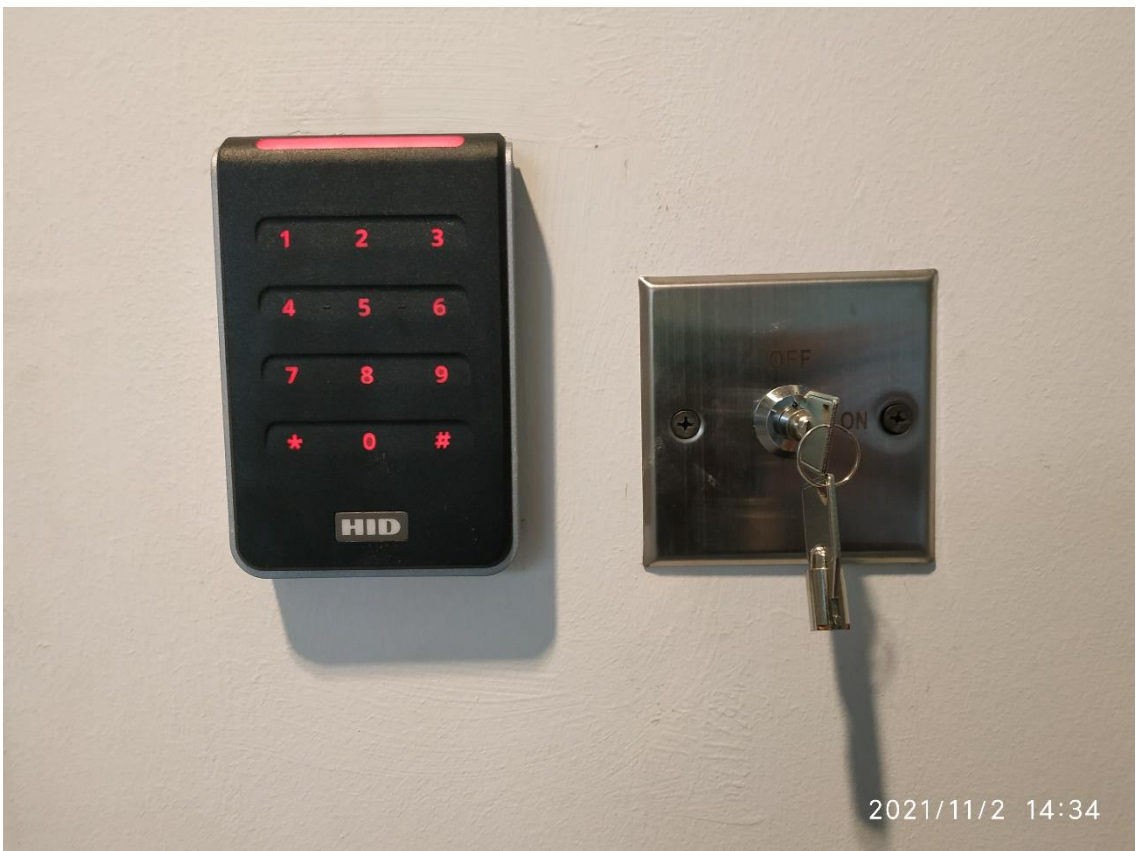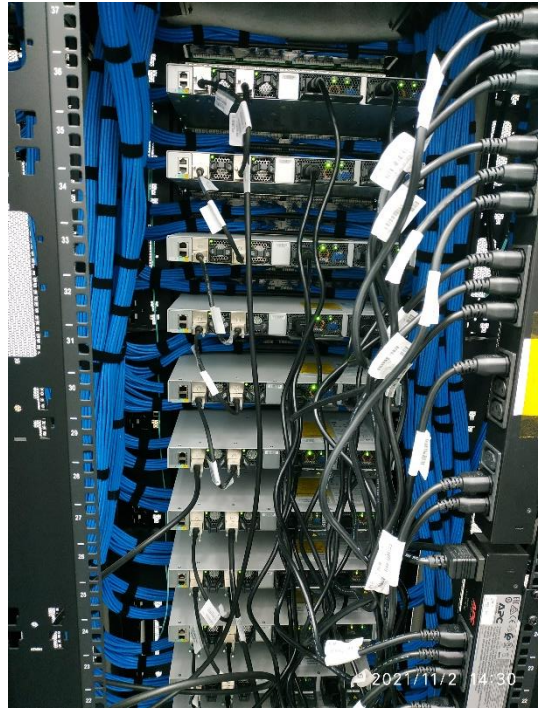
CHAPTER TWO

LITERATURE REVIEW

2.1   INTRODUCTION OF BUILDING AUTOMATION SYSTEM
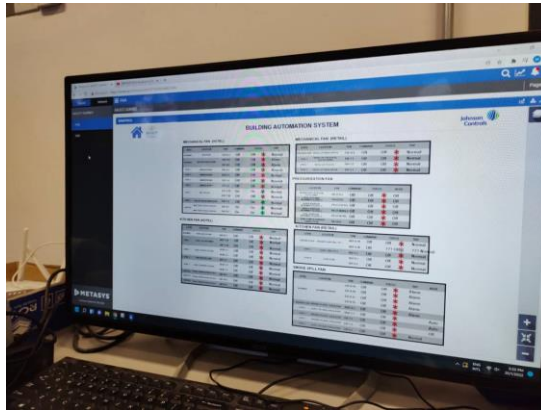
Figure 2. 1: Building Automation System

As stated by Thomas Novak et al (2007), Building automation and control systems (BACS) are an essential component of today's automated structures. They are increasingly in charge of duties impacting people's safety, security, and health. As a result, the corresponding technology is expected to function consistently, securely, safely, and efficiently. Functional safety and system security (short for safety and security) of both network nodes and communication protocols are crucial elements of such a BACS. Until recently, little effort has been taken to establish a life cycle for a safe and secure BACS, which outlines requirements for the various stages of a BACS's product life. A special emphasis is placed on the similarities between the development of safety and security systems in order to benefit from these similarities in development.

According to Morris Stelcner (2000), A building automation system (BAS) provides heating, ventilation, and air conditioning (HVAC) control, as well as management services, by utilising direct digital-control (DDC) technology. Intelligent building functions are handled by DDC systems, which rely on suitable sensors and are administered by a software-based facility-management system for centralised control. The building automation components of an intelligent building are interconnected and

capable of communicating with one another. Sensors collect and communicate data to controllers, which assure continuous and ideal conditions within the building. Automated tools identify issues, diagnose performance, and take necessary steps. An integrated BAS is intended to optimise operations across all building control systems while also optimising energy usage, directing maintenance activities, and reporting building performance. The objective is to meet the occupants' comfort, health, and safety demands at the lowest possible cost.

2.2   ELV SERVICES

ELV System for Buildings is an abbreviation for Mechanical and Electrical (M&E) Extra-Low Voltage System that is used in residential and commercial buildings to improve control and security. ELVs are systems that operate on low voltages (within 50V AC or 120V DC).

According to the International Electrotechnical Commission (1996), ELV is the terminology used in the construction world in an attempt to electrically define all the systems in a building which need electricity to run but are not part of the building's main electrical system. They do not specify a specific system, but rather refer to a wide variety of seemingly unrelated systems that operate within certain voltage levels. ELV covers all the new modern technologies that are increasingly becoming must-have systems in every building such as data network, CCTV, fire alarm systems, public address systems, audio/video solutions, access control and intrusion detection systems, home automation, WIFI and others.

2.2.1 CLOSED-CIRCUIT TELEVISION (CCTV)

Figure 2. 2: CCTV

Surveillance cameras with closed-circuit television also known as CCTV play an important part in modern police and crime prevention (Welsh & Farrington, 2009). According to Vacharee Prashyanusorn et al (2010), Closed-circuit Television (CCTV) system are now widely used and can be found in building, shop, manufacturing industries, citizens' houses and others. This system can aid in the reduction of crime and the identification of suspects.

CCTV evidence is routinely reviewed by police all around the world in the course of investigations. Officers create event timelines, look for people of interest (such as missing people, victims, and witnesses), and identify suspects as mentioned by J.P. Davis (2018). Lynsey (2005) stated that another function of the CCTV is to monitor so that is no serious accidents occur within the shortest time indirectly can manage to identify the source of the problem. CCTV also used to track the danger and act as the source of the evidence if there is any accident occur.

2.2.2 ACCESS CONTROL SYSTEM

Figure 2. 3: Access Control System

According to Tarun (2014), access control systems are the electronic systems that are designed to control through a network, and they should have access to a network. Access Control System detect, recognizes authenticates and allows a person's admission into the premise, providing total protection and assuring the system's security.

Access control is concerned with determining the permitted actions of genuine users and mediating every attempt by a user to access a system resource. A given information technology (IT) infrastructure can deploy access control systems in a variety of locations and at various levels. Access control is used by operating systems to safeguard files and folders. Systems for managing databases Access control is used by DBMS to manage access to tables and views. Most commercially available application systems provide access control, which is typically independent of the operating systems and/or database management systems on which they are deployed (NISTG, 2006).

2.2.3 PUBLIC ADDRESS SYSTEM

Figure 2. 4: Public Address System

A public address system is made up of electrical equipment that considerably amplifies a speaker's voice so that it may reach a far bigger audience than he could talk to unaided as mentioned by I.W Green and J.P Maxfield (1923). This system amplifies vocals, musical instruments, other sound sources, or recorded sounds or music. The sound enhancement system can be used in public places where announcers, performers, and others need to hear in a distant or large area. A PA system may include multiple microphones or other sources, a mixer to combine and change multiple sources, and multiple amplifiers and speakers to increase volume or spread the sound further. Both the PA system and the intercom system are commonly used in emergency communications systems.

According to Sara C. Folta et al (2006), PA system is used for the daily announcement. However, Neiger B et al (2002) mentioned that the PA system were used in conjunction with signs to help promote the lower price items. PA announcements have also been used as part of larger social marketing interventions in anyplace such as school, shopping mall and other. PA System also used in an emergency term for example to announce the missing of children / thief / fire occur.

2.3 CONCLUSION

Jean-Philippe Vasseur and Adam Dunkels (2010), to conclude, building automation system can link with different functional systems include the ELV services which is to take action to do immediately. Also, it has many benefits on the intelligent building because of energy saving, cost reducing and good monitoring. It provides a better-quality life from the application of the system to be successful. In the future, the technology of the building automation system will become mature, more reliable and less expensive. It will integrate not only in the intelligent building, but it also will apply on the traditional building to change the quality of environment for all people in their life.

CHAPTER THREE

CASE STUDY: ACCESS CONTROL SYSTEM AT MANUFACTURING INDUSTRIES, BATU KAWAN, PENANG.

3.1 INTRODUCTION

Manufacturing industries are those that engage in the transformation of goods, materials or substances into new products. The transformational process can be physical, chemical or mechanical. Manufacturers often have plants, mills or factories that produce goods for public consumption. Machines and equipment are typically used in the process of manufacturing.

Factories lie at the core of the manufacturing industry and are often targeted by opportunist criminals for several reasons that include high-value raw materials, equipment, and machinery inside them, their large size making it difficult to maintain complete visibility throughout the site, and the absence of factory security systems. Crime against the manufacturing industry has always been an issue, disrupting not just the day-to-day factory operations but also adversely affecting their output and contribution to the economy.

Failing to secure premises against unauthorised access may result in theft, anti-social behaviour, and accidents that can harm the people inside and disrupt the flow of operations. Unauthorised access is when an employee or member of the public enters an area that is off-limits to them. It can be done using various means such as entering through an unlocked door, using stolen keys, breaking down a weak door, tailgating, or convincing an authorised party to allow access.

Regardless of how it is done, it can have disastrous consequences for a business and its productivity, and in the case of factories, which are typically large in size, intrusions can easily go undetected until after the damage has been done. Manufacturers and factory owners want a realistic solution for controlling and managing access across the site without relying on keys, which are easily lost, stolen, or copied.

3.2 ADVANTAGES OF THE ACCESS CONTROL SYSTEM AT MANUFACTURING INDUSRIES

Access control systems are keyless entry systems that permit or restrict access to a property or a specified area inside the property using a number of authentication techniques. Access cards, codes, key fobs, biometrics, and smart access are some of the most often used authentication mechanisms. Access control systems enable you manage and regulate access while also providing a slew of additional advantages, such as:

- **DETECTING AND PREVENTING INTRUSIONS**

Intruders can take any form – workers, employees, visitors, and strangers – and because factories have a large number of people coming and going all day, it is critical for factory owners and managers to implement an effective access control system that not only detects intrusions but also prevents them from occurring in the first place.

- **CONTROLLING WHO HAS ACCESS TO THE SITE**

Factory owners face the challenge of having to manage and control access for many employees and visitors within the premises, all of whom have specific access privileges for certain areas of the factory. Access control systems can be used to customise access permissions according to each individual's needs, allowing the factory owners and managers to control who uses which door of the factory and at what time of the day or night.

- **FACTORY AND EQUIPMENT SAFETY**

To prevent accidents and injuries, factories, particularly those operating in hazardous settings and with risky equipment and machinery, must guarantee that only trained and authorised employees have access to the primary production area.

- **DETERRING CRIMINAL ACTIVITY AND THEFT**

Factory and manufacturing plants, like other commercial buildings, confront the ongoing issue of dealing with crime and security risks such as theft, invasions, vandalism, and even burning. Because of the tracking feature that comes with access control systems, it is possible to detect and prevent criminal activity, as well as make it more difficult for criminals to bypass the systems due to a high level of control and features such as two-factor authentication.

- **HISTORY LOGGING AND REPORTS**

Modern access control systems allow you to track individual access and record every time access is given or refused to them. These thorough reports properly state the user's details, as determined by the authentication credentials used, as well as the time and location of the access request.

- **ELIMINATING THE NEED FOR KEYS**

Using traditional keys can also be risky since they have the potential to be easily copied, as compared to access control systems that are not only efficient, practical, and easy to use, but also safer and much more secure.

3.3 PROJECT INFORMATION & TEAM

Main Project Title	CADANGAN KERJA-KERJA PENGUBAHSUAIAN KILANG SETINGKAT, PEJABAT DUA TINGKAT DI ATAS LOT PT 6013, JALAN CASSIA SELATAN 6/4, TAMAN PERINDUSTRIAN BATU KAWAN, MUKIM 13, SEBERANG PERAI SELATAN
Sub-Con Project Title	SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF EXTRA LOW VOLTAGE (ELV) SERVICES
Client	Tetuan Applied Engineering Technology (M) Sdn Bhd
Contract Amount	RM 1,504,903.25
Type of Contract	Turnkey Contract / Design and Build
Contract Period	12 Months
Civil & Structural Engineer	Perunding LW (PG0438671-T) A-01-12 Sea View Tower, Jalan Harbour Place, 12100, Butterworth, Penang. Email: eweetan@gmail.com
Mechanical & Electrical Engineer	O & A Consult Sdn Bhd (817575-V) 381A-2-10, Jalan perak, 11600, Penang. Email: oa.consult@gmail.com
ELV Contractor (Sub)	Radical Internetwork Sdn Bhd (925389-P) No. 7, Persara Mahsuri Lima, Taman Melati Jaya, 11950, Bayan Lepas, Penang. Email: info@risb.net
Quantity Surveyor	Kuantibina Sdn Bhd (0119764-M) No. 2.1, 2nd Floor, 405, Jalan Burma, Pulau Tikus, 10350, George Town, Penang. Email: kuantibina@gmail.com
Main Contractor	IFC Solution Sdb Bhd (754564-M) Menara Perdana Level 09-04 & 05, 101, Jalan Gurdwara, 10300 Penang. Email: ifc@ifcgroup.com.my

Table 3. 1: Project Information

3.4 SITE LOCATION

3.4.1 KEY PLAN
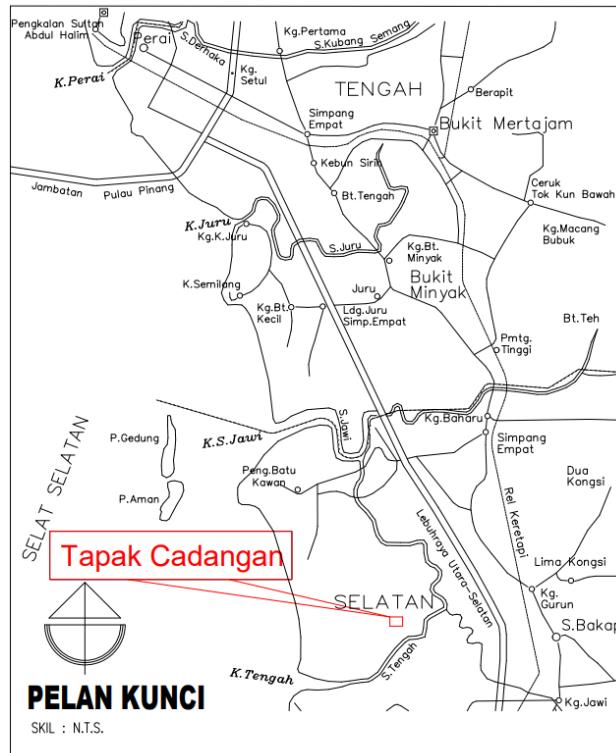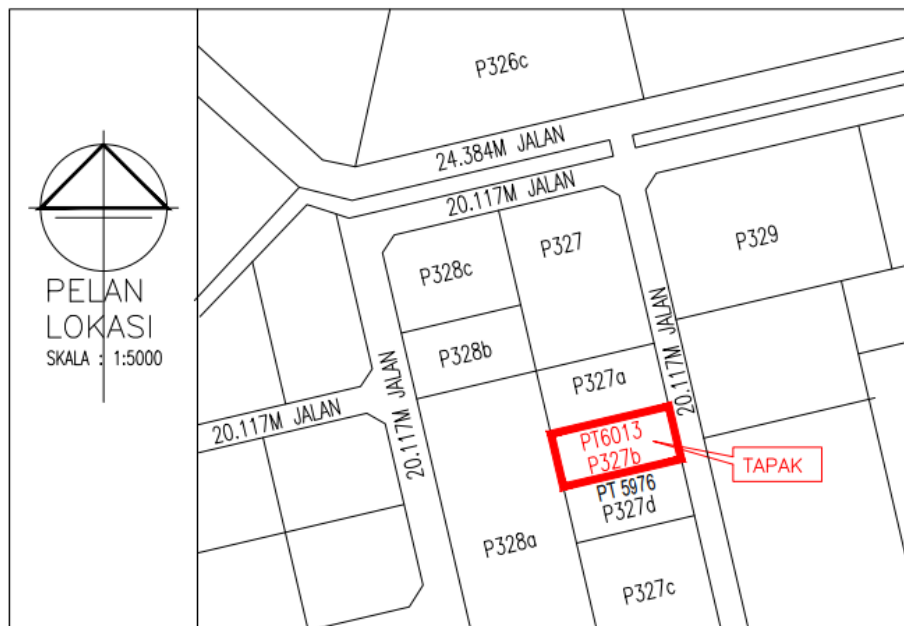

Figure 3. 1: Key Plan

3.4.2 LOCATION PLAN
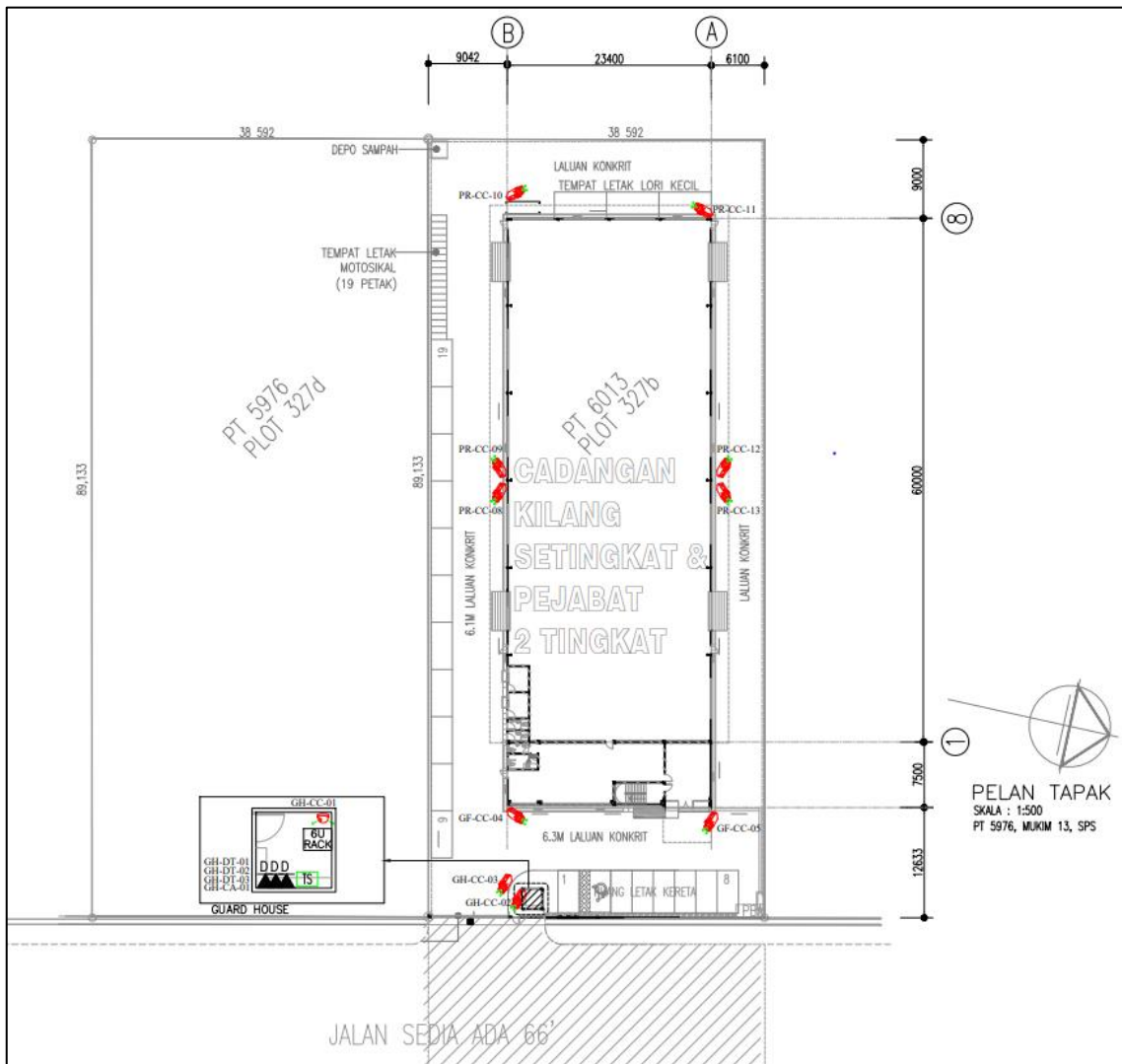

Figure 3. 2: Location Plan

3.4.3 SITE PLAN
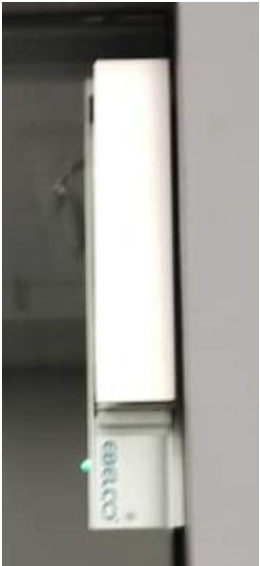
Figure 3. 3: Site Plan

3.5 COMPONENT OF ACCESS CONTROL SYSTEM

In many various types of buildings, access control systems are a vital aspect of improving security. These systems are the most effective means of monitoring and restricting access to a full building or specific areas inside a facility. Although these systems appear to be simple, they are made up of several separate components. Below is the components of an access control system.

No	Items	Description
1	Access Card Figure 3. 4: Card Access	Keys will be replaced by access cards. People will use their access cards to obtain entry to the building or specific area of the building by scanning them. Each access card will have its own unique code, allowing user to simply regulate access, turning it on and off at various times or in different regions of the facility. Access cards are often the size of a credit card, making them convenient to carry around and store in a wallet.
4	Alarm system Figure 3. 5: Alarm System	Fire alarms, burglary alarms, and intrusion detection alarms are often integrated with access control. If an unauthorized person attempts to enter the doors controlled by electric lock hardware, your access control system can signal the alarm to go off. In the event of an emergency like a fire, in addition to sounding an alarm, your access control system can temporarily turn off locks that might impede quick exit from a building.

2	Card Readers and Keypads	The card reader is the device that reads access cards and grants access to the user. The number of card readers in an access control system will be determined by the number of entrances to which you want limited access. Card readers are normally positioned on or next to the door that they control.
	Figure 3. 6: Card Reader and Keypads	Another method of entrance is by access control keypads. Instead of scanning an access card, user use a numeric keypad to enter a code. For an extra layer of security, a door might have a card reader and a keypad, requiring an access card and a correct passcode in order to gain entry.
3	Electromagnetic Lock	The EM Lock actually locks and unlocks the doors is a part of the access control system as well. EM Lock will electronically unlock door after a touch a access card or keypad code entry, and electronically lock the door again when it closes.
	Figure 3. 7: EM Lock	
5	Field Panel / Controller	Field panels are the control panels that connect all other parts of your access control system such as your card readers, keypads, hardware, and more. Field panels are used to

Figure 3. 8: Field Panel / Controller

process access control activity for the whole building. The number of panels will be determined by the size of the building, the size of the system, and the extent to which the system is used. Field panels are typically installed in telephone, electrical, or communication closets.

3.6 METHOD STATEMENT

3.6.1 PURPOSE OF THE INSTALLATION

This Installation method statement covers the Guidance of Installation of the Access Control System which will be installed in the project.

The Access Control System Includes the following:

- Control Panel with Card Reader Modules and Power Supply
- Field Devices (Card Reader, Electromagnetic Lock, Door Contact, Break Glass, Push Button)
- Client / Server Workstation
- Connection to LAN
- Integration with CCTV system
- This procedure is to be read in conjunction with relevant Operators Manual & User's guide.
- SUPPLIER's Engineer will carry out the testing and commissioning of the Access Control Panel along with the MEP sub-contractor commissioning team.

3.6.2 SCOPE OF THE INSTALLATION

This document details the Security access control system Installation for Implementation proposed to the project as follow:

- ➢ Preparation of work
- ➢ Delivery and inspection upon arrival of material at site.
- ➢ Installation & Inspection of the system.

3.6.3 PURPOSE OF TESTING AND COMMISSIONING

This Commissioning Method Statement covers the Guidance of testing & commissioning of Access Control System in accordance with the approved project quality plan and relevant system specifications.

The Access Control System Includes the following:

- Control Panel with Card Reader Modules and Power Supply
- Field Devices (Card Reader, Electromagnetic Lock, Door Contact, Break Glass, Push Button)
- Client / Server Workstation
- Connection to LAN
- Integration with CCTV system

1.1 This procedure is to be read in conjunction with relevant Operators Manual & User's guide.

1.2 SUPPLIER's Engineer will carry out the testing and commissioning of the Access Control Panel along with commissioning team.

1.3 Purpose of this manual to ensure the methods used for Testing & Commissioning of Access Control described above are correct, acceptable and in line with the consultant quality system procedures to achieve the optimum results.

3.6.4 SCOPE OF TESTING AND COMMISSIONING

In this section will be cover the details of the Access Control system testing and commissioning procedures, for Implementation as follow:
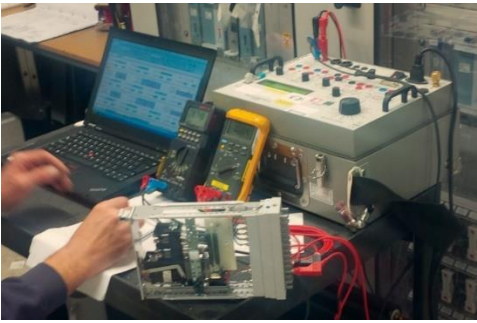
➢ Pre-commissioning procedure
➢ Testing and commissioning of the system.

3.6.5 EQUIPMENTS

NO	EQUIPMENT	DESCRIPTION
1	Fluke DTC-1800 Cable Analyzer Figure 3. 9: Fluke DTC-1800 Cable Analyzer	Used to test the strength and connectivity of Cat6. Certify multimode and singlemode fiber
2	Splicing Machines Figure 3. 10: Splicing Machine	Fusion splicing a machine is used to precisely align the two fiber ends then the glass ends are fused or welded together using some type of heat or electric arc. This produces a continuous connection between the fibers enabling very low loss light transmission.
3	Digital Multimeter for Voltage and Continuity Tests	

	 Figure 3. 11: Digital Multimeter	A continuity test is a quick check to see if a circuit is open or closed. Only a closed, complete circuit (one that is switched ON) has continuity. During a continuity test, a digital multimeter sends a small current through send a small current through the circuit to measure resistance in the circuit.
4	Ladder Figure 3. 12: Ladder	Ladder is used for a person to climb on it to do some-work at a higher place.
5	Scaffolding Figure 3. 13: Scaffolding	Temporary platform used to elevate and support workers and materials during the construction, repair or cleaning of a structure or machine.

6	Commissioning Laptop	Used to ensure that all systems and components of a building is functioning well.
	Figure 3. 14: Commissioning Laptop	
7	Safety Shoe	Protect feet from foot injuries and prevent exhaustion.
	Figure 3. 15: Safety Shoe	
8	Safety Helmet	Protect the user's head against: impact from objects falling from above, by resisting and deflecting blows to the head.
	Figure 3. 16: Safety Helmet	
9	Fluorescent Vest	Allow the wearer to be seen and to alert all that a person is present especially in a low visibility situation.
	Figure 3. 17: Fluorescent Vest	

10	Safety Glasses	Protect against impact hazards and or flying particles, dust, sparks and glare.
	Figure 3. 18: Safety Glasses	
11	Hand Crimper Tool	To tighten the head of RJ45
	Figure 3. 19: Hand Crimper Tool	

3.6.6 INSTALLATION PROCEDURE OF ACCESS CONTROL SYSTEM

INSTALLATION PROCEDURE OF ACCESS CONTROL	
1. Drawing for installation of Access Control System shall be approved and shall be coordinated with other services. 2. Room clearance & proper access shall be provided as per approved program. 3. Location/ area shall be ready for site installation. Prior to the installation, the area where the items to be installed shall be inspected to ensure architectural works and finishing are complete and area is free from dust. 4. Wall or ceiling mounting of the product should follow the instructions for the mount used and use approved installation practise appropriate for the structure and material the mount is being attached to. 5. Prior Installation, check all cabling as per wiring detail drawings. 6. Mark the device / panels location and leave enough length of cable at both ends for termination. 7. During installation, drilling operation is required on the wall with proper marking. 8. Check the power and control wiring at panel end. 9. At panel end make the proper insulation to the wiring to protect insulation to the wiring to protect from cable damage,	 Figure 3. 20: As per drawing Figure 3. 21: Site Location (Ready for installation)
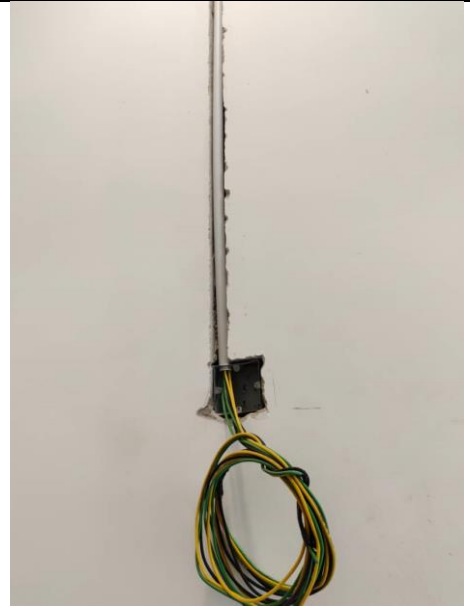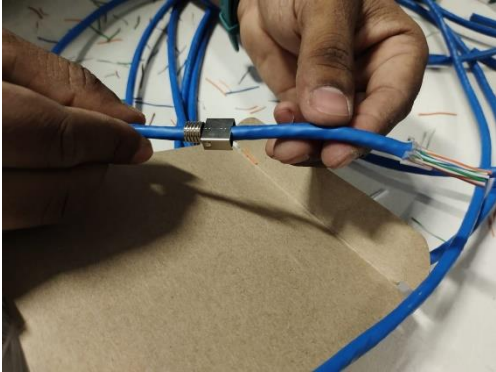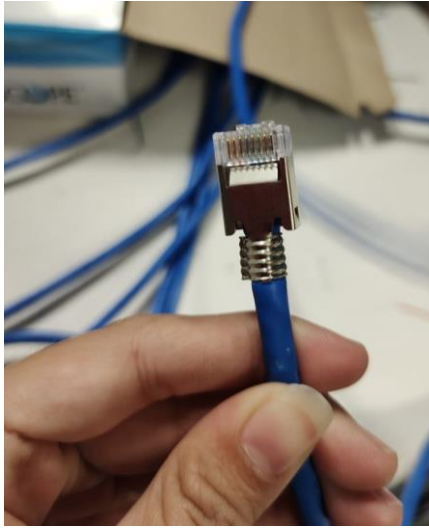
Figure 3. 22: Installation of the Cabling

3.6.7 INSTALLATION OF CARD READER

INSTALLATION OF CARD READER	
1. Exact location of the card reader shall be as per approved Access Control System device Layout Plan. 2. The height of the card reader shall be as per approved Access Control System Device Layout Plan. 3. Remove mounting plate from the Card reader and fix into concealed back box using screw proper hardware. 4. Pull out the field wiring from back box through card reader mounting plate hole. 5. For termination, stripe the cable with wire stripper then twist the cable and screw it into the card reader terminal strip as per typical wiring detail diagram. 6. Push back all the excess cables into the concealed back box and fix the card reader in the mounting plate.	 Figure 3. 23: Installation of Card Reader Figure 3. 24: Termination Figure 3. 25: Complete Termination

3.6.8 INSTALLATION OF SINGLE INTERFACE

SINGLE READER INTERFACE	
1. Exact location of the single reader interface shall be as per approved drawing.	Figure 3. 26: Controller (inside)
2. Single reader interface will be installed as per the access control system approved shop drawing and as per installation manual.	
3. Install appropriate enclosure power supply onto the wall above false ceiling as mentioned in the approved drawing.	
4. Fix the single reader interface inside the enclosure. Ensure all the screw fastened and SRI is installed perfectly.	
5. Bring all the cables from conduit / trunking into the enclosure and then take them out for labelling and termination.	Figure 3. 27: Controller (installation)
6. For termination, stripe the cable with wire stripper then twist the cable and screw it into the card reader controller terminal strip as per typical wiring detail diagram.	
7. Push back all the excess cables into the concealed back box and fix the card reader controller in the mounting plate.	

3.6.9 INSTALLATION OF EXIT PUSH BUTTON

INSTALLATION OF EXIT PUSH BUTTON	
1. The request to exit button shall be installed on the secure side of the door. 2. The final location of the RTE shall be as per the approved Access Control system layout drawing 3. The final mounting height of the RTE shall be as per the approved Access Control System layout drawing. 4. Pullout the cable from the 3x3 back box installed embeded on the wall. Terminate the appropriate cableon the RTE and mount the RTE on the 3x3 backbox. 5. All the labelling of the devices and cables shall be in acccordance with the approved Access Control layout drawing.	 Figure 3. 28: Installation of exit push button Figure 3. 29: Exit Push Button

3.6.10 INSTALLATION OF DOOR CONTACT AND EM LOCK

INSTALLATION OF DOOR CONTACT AND EM LOCK	

1. Door are monitored by door contact used different types for timber and glass doors.
 	
 2. The cabled part for door contact will be installed on the door frameand the moving part of the door contacr on the door shutter.
 	
 3. The final location and mounting distance from the door frame and door type will be as per the approved typical installation drawings.
 	
 4. All the labelling devices and cables shall be accordance with the access control layout drawing.
	Figure 3. 30: Door Contact and EM Lock as per drawing
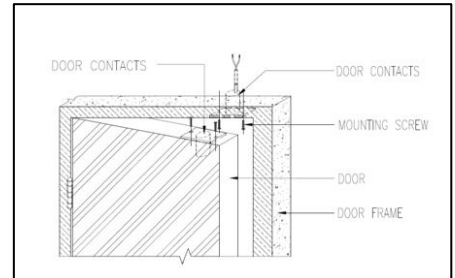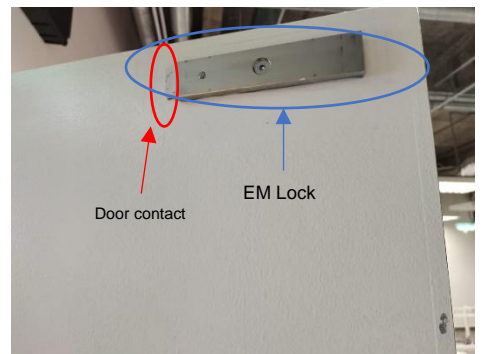	
	  Figure 3. 31: Installation of Door Contact and EM Lock at the site
	
	  Figure 3. 32: Installation of Door Contact and EM Lock at the site (close view)

3.6.11 PRE-TESTING AND COMMISSIONING WORK PROCEDURE

PRE-TESTING AND COMMISSIONING WORK	IMAGES
1. Check all the cables are identified. 2. Reader location should be properly shown in Drawings. 3. Check the panel configuration and arrangement of components and wiring 4. All the Controllers at field to be properly tagged. 5. Check the Field Devices' Cable Identification and Termination as per the Manufacturer's Instructions and also check the right power supply provided. 6. Ensure that the Readers, locks, Exit switch are installed, identified and terminated properly. 7. Ensure the Access Control Panels are connected to the secured Network Switch 8. Check the cable continuity from the Controller Level to the Field Devices.(Record the results in the test sheets) 9. Check the Door Contacts and its connection. 10. Ensure the LAN cable (CAT6) is connected between the Access Control Panel to the Network Switch. 11. Connect the Workstation PC to the LAN (PC located in the Control Room) 12. Check that the incoming 230 V AC is supplied from UPS. 13. Ensure permanent power supply must be provided to controllers and Lock hardware. 14. Access Control System should be interface with F.A.S. & C.C.T.V.	 Figure 3. 33: Testing & Commissioning Checklist Figure 3. 34: Ensure the Access Control Panel are connected to the network switch

3.6.12 CABLE TESTING (FOR EACH PANEL)

CABLE TESTING WORK	IMAGES
AIM: • Access Control Panel to the Field Devices such as Card Readers, Push Button, Break Glass, Power Supply unit, Network Switch and Electro Magnetic Locks etc. must the tested. • Ensure the Power Cable Tests between Panel and Power Supply unit and Electro Magnetic Lock to the Power Supply units. **1. Power Up** 1. Check Mains (PE,N,L) cables 2. Check Mains Voltage. 3. Check all cable termination. 4. Energise the incoming Mains Supply to Control Panels.	 Figure 3. 35: Check all cable termination Figure 3. 36: Testing and commissioning result

3.6.13 TESTING AND COMMISSIONING WORK PROCEDURE
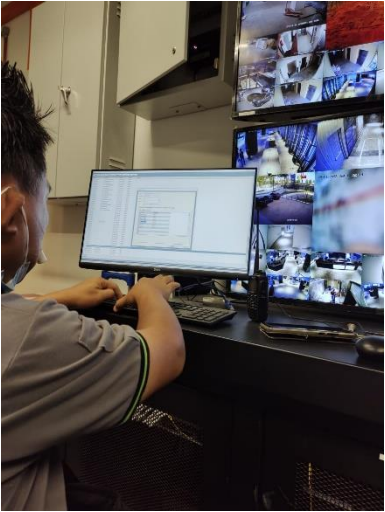
TESTING AND COMMISSIONING WORK	IMAGES
Aim: Functional Check 1. Turn-On the Power Supply (Must be equipped with Battery) of Main Access Control Panel and check the faulty notices. 2. Use Multimeter and check the output voltage of the Power Supply unit for the ACS Panel and Field Devices. 3. Install the Access control software in PC/Server and start communicating the Access Control Panel through the live Network. 4. Install, Configure the SQL Server for the Access Database. 5. Start Configuring the Access Control Panel and Field devices through the live Network 6. Once the Access Controllers are communicated, and then assign all the parameters. 7. Start the testing with the field Devices by: a. Pressing the Push Button to check the Door Operation through the Magnetic Lock. b. Break Glass to check the Door Operation through the Magnetic Lock & Alarm Generation in the PC. c. Flashing the Smart Card into the Card Readers to check the Door Operation through the Magnetic Lock. 8. Ensure all the Field Devices (Card Reader, Push Button, Door Contacts, Break Glass, and Power Supply Units) and Controllers are working properly. 9. Ensure Interlocking with Fire Alarm system is verified. 10. Ensure all alarms generated are noticed in the graphic loaded monitoring PC/Server.	 Figure 3. 37: Testing the device

11. Ensure Access Control System had an interface with C.C.T.V. system. 12. Ensure from the software that locking hardware functioning correctly. 13. Ensure the I/O configuration is done as per the requirements in the Software. 14. All the doors and door equipment's is Label as per approved drawings in the graphic loaded monitoring PC/Server. 15. Verify that all the door opening status is displayed in the PC/Server. 16. Ensure all events are report back to the PC where Access Control Software installed 17. Configure the Redundant Server and connect to the LAN. 18. Monitor the Software functionalities (PC/Server related) and its operations.	
Task: Battery Connection **Aim**: Functional Check Note: the batteries must be connected before the mains power. Note: the control panel will not operate on batteries until the mains power has been applied. 1. Connecting the batteries to the Control Panel should only be performed after the wiring checks have been completed successfully.	

3.6.14 POST-TESTING AND COMMISSIONING WORK PROCEDURE

POST-TESTING AND COMMISSIONING WORK	IMAGES
TASK: System Demonstration Notes: After the successful commissioning the results will be recorded on the testing and commissioning sheets. 1. After the successful completion of testing & commissioning the system will be ready to be demonstrated to the facility management team and all concerned parties. 2. During this period SUPPLIER engineer will assist the involved parties to operate and familiarise with the system. 3. All operations will be carried out by the operators and facility team in this period until they are able to handle the system without any doubts. 4. One day demonstration will be provided by SUPPLIER engineer and next 3 days will be assumed as familiarisation period to the concerned parties. Any doubts or clarifications they may require to be clarified in these days will be done by SUPPLIER engineer	 Figure 3. 38: System Demonstration
Commissioning Documentation 1. After completion of commissioning, all test certificates of Commissioning will be submitted in hard copy.	

3.7 HIRARC ASSESSMENT FOR THE ELV- ACCESS CONTROL SYSTEM

	HAZARD IDENTIFICATION			RISK ANALYSIS				RISK CONTROL
No	Work Activity	Hazard	Which can cause /effect	Existing risk control (if any)	likeli hood	Severity	Risk	Recommended Control Measures
1	Prepare work area and material	Unauthorized / untrained workers	Cuts Abrasions	Safety helmet Safety boots Reflective Vest	2	3	6	DSTI shall be conducted by the foreman / safety officer prior to work commencement. Task specific safety training to be provided. Daily safety inspection should be carried out and eliminate the hazard.
2	Use of hand tools and equipment	Malfunction of the equipment	Noise Cuts	Full PPE	3	4	12	Equipment shall be inspected to confirm in good condition.
3	Clearing unused material	Sharp object	Finger cut	Nil	3	1	3	Use leather glove, use tool
4	While working at night shift	Poor illumination	Sore eyes	Provide a lamp	2	1	2	Adequate lighting shall be provided while working
5	While working in hot weather	Heat stress	Dehydration	Nil	2	1	2	Provide drinking facilities

6	Use of ladder / scaffolder	Uneven floor Obstructing the access way	Fall from above Broken Leg	Housekeeping Safety boots Safety Helmet	3	4	12	Scaffolder and ladder should be inspected. Put plank on floor or anti-slip mat. Adequate lighting shall be provided while working Step ladder must fully open and lock the devices as per manufacturer recommendations.
7	Testing & commissioning	Unauthorized / Untrained person Electrocution Broken cable	Electric shock Burn Cut Short circuit Death	Circuit is not live Reflective vest Safety boots	4	4	16	Electrical work shall not carry out in wet condition. Lock out tag out (LOTO) procedure to be followed during testing & commissioning. Disconnect main supply before commencing of work.
8	Termination Work	Unauthorized / Untrained person Electrocution Broken cable	Electric shock Burn Cut Short circuit Death	Circuit is not live Reflective vest Safety boots	4	4	16	Electrical work shall not carry out in wet condition. Lock out tag out (LOTO) procedure to be followed during testing & commissioning. Disconnect main supply before commencing of work. Do not touch the fiber during the termination work

3.8 FIRE SAFETY STRATEGY – EMERGENCY BREAKGLASS

Figure 3. 39: Emergency Breakglass

Manufacturing industries always expose to the danger such as fire because of the heavy machineries and chemical substance that are easily burn and etc. Basically there are two type of firefighting system that can be used in manufacturing industries such as active and passive fighting system. Both types have their own advantages and disadvantages and both are value in the overall fire safety design. The fire safety strategy in this case are emergency breakglass.

Emergency breakglass devices are meant for use in an emergency and may affect the approval of an electric locking system. In the case of an emergency, an emergency breakglass will give a physical technique of releasing an electromagnetic lock. In high-security environments, emergency breakglass is generally installed on exit doors. Emergency Breakglass can release a single door or all of the doors on the same circuit, as well as providing an auxiliary contact for remote monitoring, CCTV activation, or alarm activation.

CHAPTER FOUR

CHALLENGES OF THE ELV WORKS

4.1 INTRODUCTION

Based on the project, structured cabling of the ELV Services during the construction work project consists of more risk and problem which cannot be seen as early during the preliminary stage. This problem may affect the project period and cost which need to be tackle and manage during the preliminary stage. There are also contractor and consultant which not familiar with the ELV design and installation that can cause more wastage of the cable.

4.2 CHALLENGES OF THE ELV WORKS

4.2.1   CHALLENGES DURING THE DESIGN STAGES
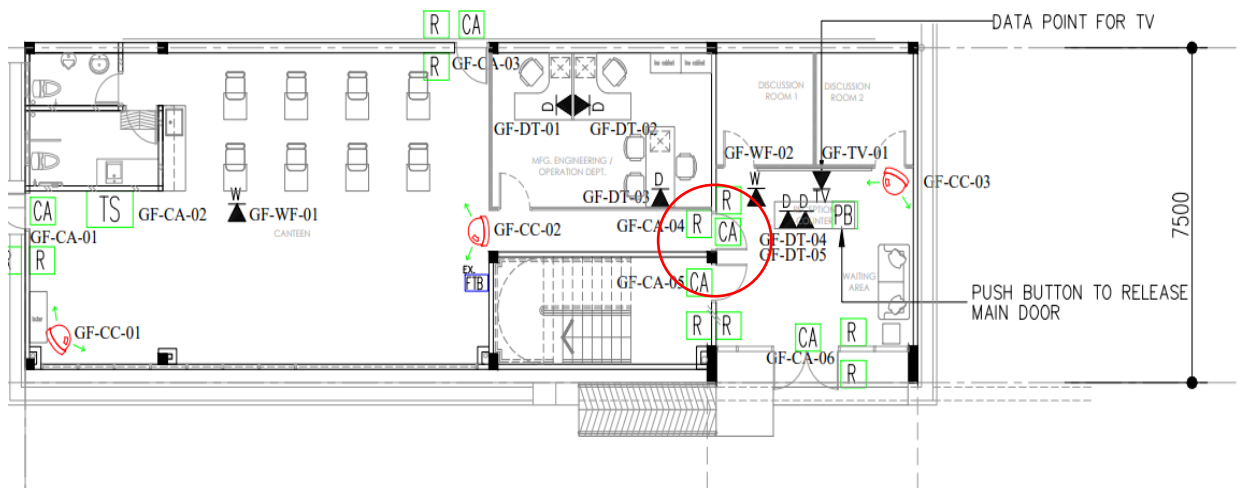
Figure 4. 1: Card Access Reader Coordination

There are few challenges that are faces in the case study during the installation of the ELV services during the design stage. This happened due to the last minutes changes of the door coordination. Before the door is install, the technical support of the elv services will lay down the cable at the place that had been concealed to install the card access reader. In the safety and design term, the reader, push button, emergency

break glass should have on the left-hand side if the door were swing to the right and vise verse.

According to the floor plan, the door is swing to the right and the push button, reader and other should the on the left-hand side, however the main-contractor install the door at the wrong side. Indirectly, will affected the design stage. Hence, the elv sub-con need to lay down another cable to pull it until it reaches on the other side. Indirectly this incident will lead to the delay of the project.

4.2.2 CHALLENGES DURING THE TERMINATION WORK

Cable Termination is the connection of the CAT6 or fiber to a device, such as equipment, panels or a wall outlet, which allows for connecting the cable to other cables or devices. This involves the organizing of cables by destination, forming and dressing cables, and proper labelling as well as creating a connection with a copper or fiber conductor. In order to begin, there is planning that must take place. Prepare for the termination by developing a strategy for the cable beginning and end, making sure that have the proper tools to complete the job. The cable connection is not complete until all terminations are properly identified and labelled.
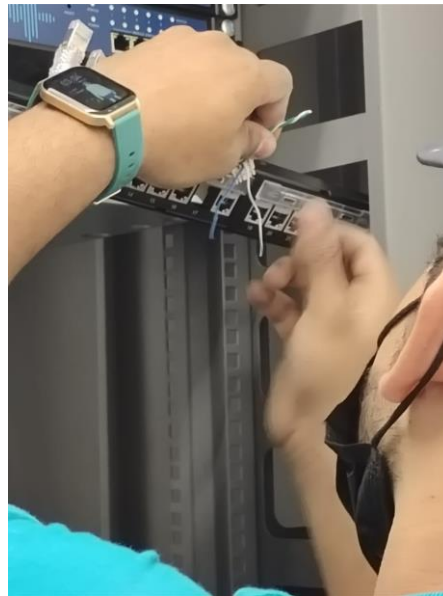
Figure 4. 2: Fiber termination work

While doing the cable termination work, required a skilled labour, because if the termination work is failed it will cause the cable become shorter and will increase the cost due to the wastage. After done the termination work, the labour required to do the testing and commission in order to measure the cable is well function or in either way. If the testing shows fail, the labour need to cut the cable include the RJ45, hence this shows the waste of the material and time. Labour needs to redo until the testing and commission show the result is pass. Next, safety during the termination work is a risky work where if there is a trip probably can cause the electric shock or burning.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

In conclusion, ELV Services work is a challenging process where many risk and uncertainties occur during the installation work. A unskilled labour or unexperienced person in the installation of the lev works might failed to manage the project successfully. Based on the current project, a lot of uncertainties found during the project which affected the project cost and also lead to the delay. It is important to appoint experiences contractor in the ELV Services because to control and manage the building project which can produce good services and the building become more secure. In ELV Services work, different project may get different risk and uncertainties that could happen which this only can be handle with the supervision of the experience / skilled labour where the might have rough idea on the site situation and condition.

5.2 RECOMMENDATION

Throughout this practical training report, there are some recommendations that can be made to which to properly manage and choose the right method or approach in this ELV services work in order to make the project success:

- Provide a training to the unskilled labour in order to enhance their skill which can reduce the time management and reduce the wastage indirectly can minimize the cost and increase the time completion.
- Provide a safety procedure to the labour about the lay cable, installation and termination work which is to avoid any accident occur during the work.

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APPENDIX

1. CHECKLIST ACCESS CONTROL SYSTEM INSTALLATION

<table>
<tr><td colspan="4">CHECK LIST FOR:</td><td colspan="4">Form No:</td></tr>
<tr><td colspan="4" align="center">Security Access Control System Installation</td><td colspan="4">Rev. No : 0</td></tr>
<tr><td colspan="2">SUBCONTRACTOR ☐</td><td colspan="2">CONTRACTOR ☐</td><td colspan="4">Page : 56 of 1</td></tr>
<tr><td colspan="4">SECTION OF WORK: Electrical</td><td colspan="4">LOCATION:</td></tr>
<tr><td colspan="4">LEVEL:</td><td colspan="4">WIR No.:</td></tr>
<tr>
<td rowspan="2">STAGE</td>
<td rowspan="2" align="center">ITEM</td>
<td colspan="2">Checked by</td>
<td>Checked by</td>
<td rowspan="2">Date</td>
</tr>
<tr>
<td>S/C</td>
<td>CONT</td>
<td>CONS.</td>
</tr>
<tr>
<td rowspan="3">SETTING OUT</td>
<td>Check Approved Shop drawings/Layouts.</td>
<td></td><td></td><td></td><td></td>
</tr>
<tr>
<td>Check Level as per approved Coordination drawings.</td>
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<tr>
<td>Check that material as per approved material submittal.</td>
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<tr>
<td>MEP/CIVIL</td>
<td>Check for civil clearance</td>
<td></td><td></td><td></td><td></td>
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<tr>
<td rowspan="8">Security Access Control System Installation</td>
<td>1. Check the materials are approved</td>
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<tr>
<td>2. check the wiring is in correct manner</td>
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<tr>
<td>3. Check the status for all connected controllers and readers</td>
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<tr>
<td>4. Check the connection of readers</td>
<td></td><td></td><td></td><td></td>
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<tr>
<td>5. Check the connection of Door lock.</td>
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<tr>
<td>6. Check the connection of the push button with Card reader and Lock.</td>
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<tr>
<td>7. check the panel installation</td>
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<tr>
<td>8. Check the identification inside the panel</td>
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<tr>
<td rowspan="5">SAFETY PRECAUTIONS</td>
<td>1. Adequate lights are provided in the Work Area prior to installation.</td>
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<tr>
<td>2. All terminations cables have been checked for any damage or improper connections.</td>
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<tr>
<td>3. Ensure that barricade & warning boards on the area are available prior to installation.</td>
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<tr>
<td>4. Ensure all supports have been properly installed & fixed prior to running the pumps.</td>
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<tr>
<td>5. Ensure no obstacles in the area. Maintain proper housekeeping.</td>
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</tr>
</table>

	6. Ensure all personnel performing the installation shall have proper training & experience.				
	7. Ensure all electrical tools to be used in the installation are not damage.				
For S/C QA/QC:	**Date:**	**FOR CONTRACTOR QA/QC:**	**Date:**	**For CONS. Rep.:**	**Date:**
Name:	**Sign:**	**Name:**	**Sign:**	**Name:**	**Sign:**

2. INSPECTION AND TEST PLAN OF THE ACCESS CONTROL SYSTEM INSTALLATION

<table>
<tr><td colspan="5" rowspan="2" style="text-align:center">PROJECT NAME</td><td colspan="3">INSPECTION & TEST PLAN</td></tr>
<tr><td colspan="3">REF. NO.</td></tr>
<tr><td colspan="5"></td><td colspan="3">REV. NO.   0</td></tr>
<tr><td colspan="5"></td><td colspan="3">DATE :</td></tr>
<tr><td colspan="5"></td><td colspan="3">PAGE :   1 OF 1</td></tr>
</table>

ACTIVITY:	Access Control System Installation						
AREA/LOCATION:							
ITP approved by CONTRACTOR's QA/QC:				ITP approved by Consultant:			
Signature:				Signature:			
Date:				Date:			

SERIAL NO.	DESCRIPTION	FREQUENCY	SPECIFICATION / CRITERIA	INSPECTION LEVEL			VERIFICATION RECORD
				S/C	CONTRACTOR	Consultant	
1	**DOCUMENTATION**						
1.1	Pre-Qualification subcontractor	Once (Approval prior to submit the submittal)	Project Specifications and drawings.	H	H	R	
1.2	Shop Drawing Approval	Each Shop Drawing	Project Specifications and drawings.	H	H	R	
1.3	Material Approval	Each MAR (prior to order the material).	Project Specifications and drawings.	H	H	R	
1.4	Method Statement Approval	Once (Approval prior to start of activity)	Project Specifications and drawings.	H	H	R	
2	**MATERIAL INSPECTION**						
2.1	Check the Material as per approved submittal.	Each Delivery	Project Specifications and drawings.	H	H	H	
3	**Installation**						
3.1	Installation of the system	Each Area where applicable (As per Consultant requirements)	Project Specifications and drawings.	H	H	H	

LEGEND: H: HOLD   W: WITNESS   S: SURVEILLANCE   R: REVIEW

ITP Sign-Off post completion of Works

CONTRACTOR APPROVAL	Consultant APPROVAL
NAME :	NAME :
SIGN :	SIGN :
DATE:	DATE:

3. PRE-COMMISSIONING OF ACCESS CONTROL SYSTEM

CHECK LIST FOR:						
Security Access Control System Testing and commissioning **(Pre-Commissioning – Visual Inspection)**				Form No: Rev. No : 0 Page : 1 of 1		
SUBCONTRACTOR X		**CONTRACTOR** ☐				
SECTION OF WORK: Electrical **LOCATION:** **LEVEL:** **WIR No.:**						

STAGE	ITEM	Checked by		Checked by	Date
		S/C	CONT	CONS.	
Pre-Commissioning OF ACCESS CONTROL SYSTEM	1. Commissioning procedures reviewed				
	2. Operation and maintenance information				
	3. System Completeness				
	4. Location of Control Unit Panels (accessible)				
	5. Control panel environmental conditions as per manufacturer's guidelines				
	6. Ensure that the Readers, locks, Exit switch are installed and terminated properly.				
	7. Reader location should be properly shown in Drawings.				
	8. All the Controllers at field to be properly tagged.				
	9. Ensure permanent power supply must be provided to controllers and Lock hardware.				
	10. All wires in the controllers to be identified.				
	11. Ensure Interlocking with Fire Alarm system is activated.				
	12. Ensure the I/O connection is done as per the requirements				
	13. Check the panel configuration and arrangement of components and wiring				
	14. Check that the incoming 230 V ac is supplied from UPS				
	15. Ensure the Access Control Panels are connected to the secured Network Switch				
	16. Ensure the software loaded PC/servers are connected to the Secured Network Switch				
	17. Ensure the system Interfaced with F.A.S. & CCTV.				

For S/C QA/QC: Date:	FOR CONTRACTOR Date: QA/QC:	For CONS. Rep.: Date:
Name: Sign:	Name: Sign:	Name: Sign:

4. CHECKLIST SECURITY ACCESS CONTROL SYSTEM TESTING AND COMMISSIONING

<table>
<tr>
<td colspan="4">CHECK LIST FOR:
Security Access Control System Testing and commissioning

(Commissioning Report)</td>
<td>Form No:
Rev. No : 0
Page : 60 of 2</td>
</tr>
<tr>
<td colspan="2">SUBCONTRACTOR   X</td>
<td colspan="3">CONTRACTOR</td>
</tr>
<tr>
<td colspan="2">SECTION OF WORK: Electrical
LEVEL:</td>
<td colspan="3">LOCATION:
WIR No.:</td>
</tr>
</table>

Details	
Control unit manufacturer :	
Building Name:	
Panel location:	

CONTROL PANEL

Check	Yes	No	Comments
Installation of Termination boards			
Proper identification of cables			
Proper termination of data/Ethernet cables			
Proper termination of power cables			
Status of Alarm indicators			
Status of Alarm Sounders			
Status of fault indicators			
Status of power failure			
Status of Battery failure			
Status of Fire alarm interface			
Other (specify)			

FIELD DEVICES

Check	Yes	No	Comments
Status of Access Card Reader			
Status of Push Button			
Status of Electro Magnetic Lock			
Status of Break Glass			

Status of Power Supply Units			
Status of Network Switch			
Status of Door Contacts			
Status of Server and Work Station			
SYSTEM POWER SUPPLY			

a) Primary (main) :   Nominal voltage ____230_____ Amps_____

Over current protection :   Type   FUSE____Amps_13_____

Location (Primary Supply Panel Board)

b) Secondary (Standby) :

_____Storage Battery : Amp _____Hr. Rating _____

Calculated capacity in _____Amp_____ Hr to operate system for _____

Type of Battery : Lead Acid

CHECK LIST : PRIOR TO ANY TESTING			
Description	**Yes**	**No**	**Comments**
Notifications are made to			
Building Occupants	☐	☐	
Building Management	☐	☐	
Others (specify)	☐	☐	
SYSTEM TESTS AND INSPECTIONS			
Type	**Visual**	**Functional**	**Comments**
Control Panel	☐	☐	
Interface with FA System	☐	☐	
Interface with CCTV system	☐	☐	
Lamps/LEDs	☐	☐	

Fuses	☐	☐	
Primary Power Supply	☐	☐	
Fault Indication	☐	☐	
SECONDARY POWER			
Battery condition	☐	☐	
Load Voltage	☐	☐	
Charger Test	☐	☐	
For S/C QA/QC: **Date:**	**FOR CONTRACTOR QA/QC:** **Date:**		**For CONS. Rep.:** **Date:**
Name: **Sign:**	**Name:** **Sign:**		**Name:** **Sign:**

5. INSPECTION AND TEST ACCESS CONTROL SYSTEM TESTING AND COMMISSIONING

	PROJECT NAME & DETAILS				INSPECTION & TEST PLAN		
					REF. NO.		
					REV. NO. 0		
					DATE :		
					PAGE : 1 OF 1		

ACTIVITY: Security Access Control System Testing and commissioning

AREA/LOCATION:

ITP approved by CONTRACTOR's QA/QC:
Signature:
Date:

ITP approved by Consultant:
Signature:
Date:

SERIAL NO.	DESCRIPTION	FREQUENCY	SPECIFICATION / CRITERIA	INSPECTION LEVEL			VERIFICATION RECORD
				S/C	CONTRACTOR	Consultant	
1	**DOCUMENTATION**						
1.1	Pre-Qualification subcontractor	Once (Approval prior to submit the submittal)	Project Specifications and drawings.	H	H	R	
1.2	Shop Drawing Approval	Each Shop Drawing	Project Specifications and drawings.	H	H	R	
1.3	Material Approval	Each MAR (prior to order the material).	Project Specifications and drawings.	H	H	R	
1.4	Method Statement Approval	Once (Approval prior to start of activity)	Project Specifications and drawings.	H	H	R	
2	**Testing and Commissioning**						
2.1	Pre-commissioning of the system	Each Area where applicable (As per Consultant requirements)	Project Specifications and drawings.	W	W	W	
2.2	Testing and commissioning of the system	Each Area where applicable (As per Consultant requirements)	Project Specifications and drawings.	W	W	H	

LEGEND: H: HOLD   W: WITNESS   S: SURVEILLANCE   R: REVIEW

ITP Sign-Off post completion of Works

CONTRACTOR APPROVAL	Consultant APPROVAL
NAME :	NAME :
SIGN :	SIGN :
DATE:	DATE:

6. AET SCHEMATIC DRAWING

CARD ACCESS DETAILS

ICT & ELV SYSTEM SCHEMATIC DIAGRAM

GUARD HOUSE

G/F OFFICE

PRODUCTION

LEVEL 1

LEVEL GROUND

LEGEND

- FIXED DOME CAMERA
- BULLET CAMERA
- READER
- CARD ACCESS CONTROLLER
- WIFI PT. (ABOVE CEILING)
- DATA PLUG-IN SOCKET (RJ45)
- TV POINT (DATA PT)
- NVR (NETWORK VIDEO RECORDER)
- 50mm x 50mm METAL TRUNKING
- 50mm x 100mm METAL TRUNKING
- 42U EQUIPMENT RACK
- CAT6 UTP PATCH CORD
- CAT6 UTP CABLE
- FIBER OPTIC CABLE
- HDMI CABLE

7. GROUND AND FIRST FLOOR OFFICE DRAWING

FRONT VIEW

REAR VIEW

GROUND FLOOR OFFICE LAYOUT

GROUND FLOOR OFFICE TRUNKING LAYOUT

FIRST FLOOR OFFICE LAYOUT

FIRST FLOOR OFFICE TRUNKING LAYOUT

8. GROUND FLOOR PRODUCTION

GROUND FLOOR PRODUCTION LAYOUT

GROUND FLOOR PRODUCTION TRUNKING LAYOUT
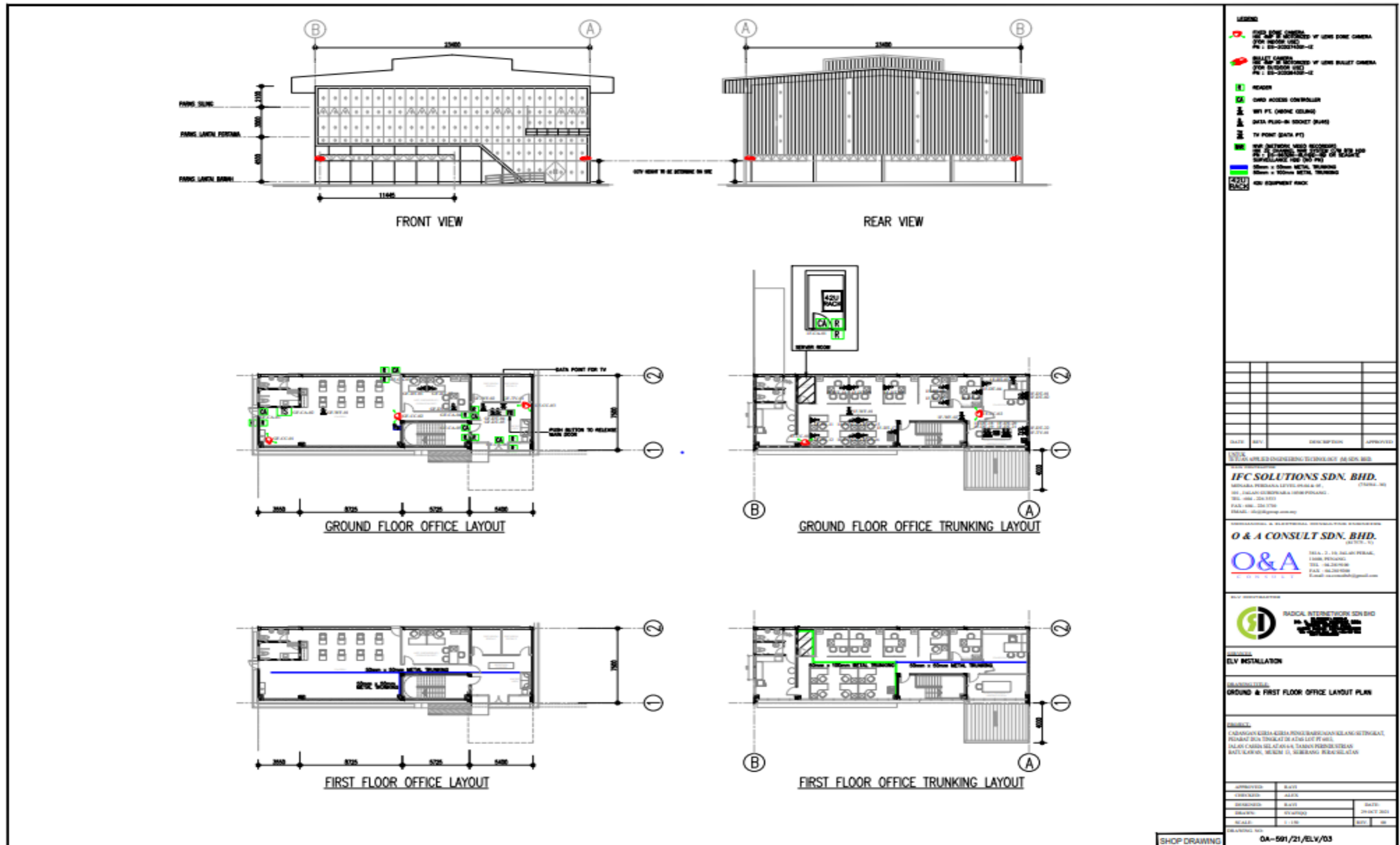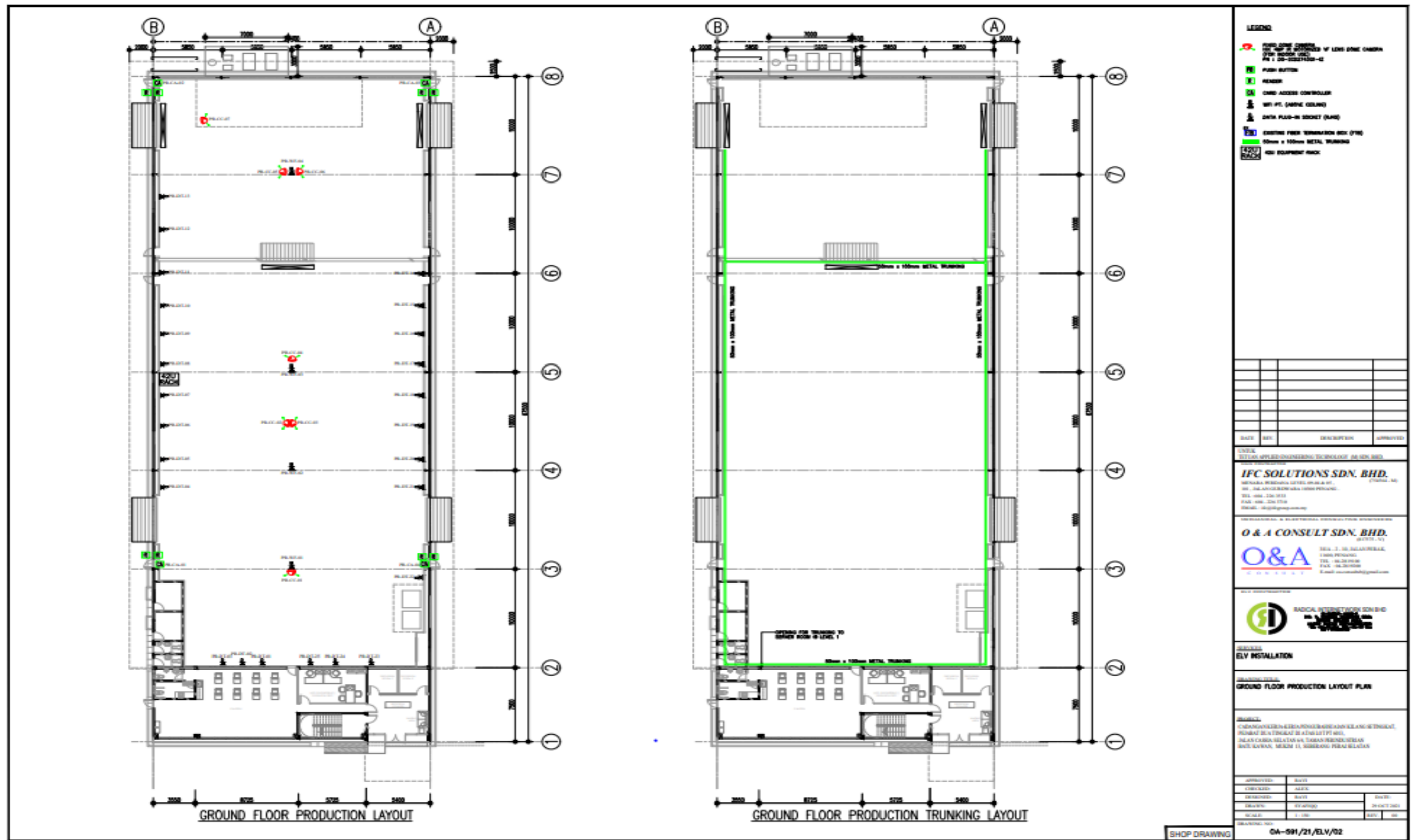
9. WORK SCHEDULE

ID	Info	Task Mode	Task Name	Duration	Start	Finish	Predecessors	% Complete
1			APPLIED ENGINEERING TECHNOLOGY (M) SDN BHD ELV PROJECT PROPOSED WORK SCHEDULE (SUBJECT TO APPROVAL)	66 days?	Fri 22/10/21	Fri 21/1/22		67%
2			PRELIMINARIES	19 days	Fri 22/10/21	Wed 17/11/21		90%
3	✓		SUBMIT MATERIAL LIST FOR APPROVAL	1 day	Fri 22/10/21	Fri 22/10/21		100%
4	✓		SITE VISIT AND MEASUREMENT	1 day	Mon 1/11/21	Mon 1/11/21	3	100%
5	✓		RECEIVE APPROVAL FOR MATERIAL LIST	1 day	Wed 3/11/21	Wed 3/11/21	4FS+3 days	100%
6	✓		ORDER MATERIAL	1 day	Wed 3/11/21	Wed 3/11/21	5SS	100%
7			PREPARE SITE MATERIALS & EQUIPMENTS	3 days	Fri 5/11/21	Tue 9/11/21		50%
8	✓		CCTV	1 day	Fri 5/11/21	Fri 5/11/21	6	100%
9	✓		CARD ACCESS	1 day	Sat 6/11/21	Mon 8/11/21	8	100%
10			AP DEVICES	1 day	Tue 9/11/21	Tue 9/11/21	9	0%
11			HP SWITCHES DELIVERY TO SITE BY PENTECH	1 day	Tue 9/11/21	Tue 9/11/21	10SS	0%
12	✓		PREPARE SHOP DRAWING, SUBMISSION AND APPROVAL	10 days	Thu 4/11/21	Wed 17/11/21	7SS	100%
13	✓		MS TRUNKING & BRACKETS DELIVERY TO SITE	1 day	Thu 4/11/21	Thu 4/11/21	12SS	100%
14	✓		CABLES & COMPONENTS DELIVERY TO SITE	1 day	Thu 11/11/21	Thu 11/11/21	16SS+4 day	100%
15			INSTALLATION	57 days?	Fri 22/10/21	Mon 10/1/22		74%
16	✓		METAL TRUNKING & PVC PIPE	6 days	Fri 5/11/21	Fri 12/11/21	13	100%
17	✓		UTP CABLES	5 days	Thu 11/11/21	Wed 17/11/21	14SS	100%
18	✓		BACKBONE FIBER CABLES	2 days	Thu 18/11/21	Fri 19/11/21	17	100%
19	✓		CCTV (PRODUCTION AREA)	7 days	Mon 22/11/21	Tue 30/11/21	18	100%
20	✓		CARD ACCESS (PRODUCTION AREA)	7 days	Mon 22/11/21	Tue 30/11/21	18SS	100%
21	✓		FTTH FIBER CABLES	2 days	Thu 25/11/21	Fri 26/11/21	18	100%
22	✓		TESTING FIBER & UTP CABLES	6 days	Mon 29/11/21	Mon 6/12/21	21	100%
23	✓		CCTV (OFFICE AREA)	4 days	Fri 3/12/21	Wed 8/12/21	19FS+2 day	100%
24	✓		CARD ACCESS (OFFICE AREA)	4 days	Fri 3/12/21	Wed 8/12/21	23SS	100%
25			AP DEVICES (OFFICE AREA)	7 days	Fri 31/12/21	Mon 10/1/22	24	0%
26			AP DEVICES (PRODUCTION AREA)	7 days	Fri 31/12/21	Mon 10/1/22	25SS	0%
27			SWITCHES	1 day?	Fri 22/10/21	Fri 22/10/21		0%
28	✓		TERMINATION	6 days	Mon 29/11/21	Mon 6/12/21		100%
29	✓		TERMINATION OF TESTING FIBER & UTP CABLES	6 days	Mon 29/11/21	Mon 6/12/21	21	100%
30			TESTING AND COMMISSIONING	63 days	Fri 22/10/21	Tue 18/1/22		0%
31			CCTV	6 days	Tue 11/1/22	Tue 18/1/22	26	0%
32			CARD ACCESS	6 days	Tue 11/1/22	Tue 18/1/22	31SS	0%
33			TRAINING	1 day	Fri 22/10/21	Fri 22/10/21		0%
34			FINAL CHECK	3 days	Wed 19/1/22	Fri 21/1/22		0%
35			TROUBLESHOOTING AND FINE TUNE SYSTEM	2 days	Wed 19/1/22	Thu 20/1/22	31	0%
36			HANDOVER	1 day	Fri 21/1/22	Fri 21/1/22	35	0%

Project: AET
Date: Mon 13/12/21

Task		Project Summary		Manual Task		Start-only
Split		Inactive Task		Duration-only		Finish-only
Milestone		Inactive Milestone		Manual Summary Rollup		External Tasks
Summary		Inactive Summary		Manual Summary		External Milestone

Deadline
Progress
Manual Progress

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Prepared by: Siti Nadiah