DEPARTMENT OF BUILT ENVIRONMENT AND TECHNOLOGY

CENTRE OF STUDIES FOR BUILDING SURVEYING

CASE STUDY: CONNECTION CABLE SERVICE PROJECTS 11KV, 33KV AND 132KV (WORKLINE ENGINEERING)

BSR666 PRACTICAL TRAINING

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Secondly, I would like to thank all the Workline Engineering staffs for their kindness and willingness to give some information about my case study. Thank you to my supervisor, Puan Syuhada and my Head of Development Unit, Encik Hakim for treating me and other interns nicely.

I would like to thank my beloved lecturer and supervisor, SR DR Wan Samsul Zamani who always helped and give information for me to complete my report perfectly and her guidance, advice, and invaluable assistance in completing the report.

Furthermore, I would like to thank my parent, my mother, for her support to me on doing the assignment. I would like to be grateful to Allah S.W.T cause gives me the ideas and chance of time to finish the assignment without any problem. Lastly, I want to thank the seniors and fellow classmates that help me doing this report.

Thank you.

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INTRODUCTION

Practical Training refers to work experience that is relevant to professional development prior to graduation. One of the requirements for the students of Degree in Building Surveying to complete the program is the students must complete at least 16 weeks of Practical Training. It started on 1st October 2021 and end on 31th January 2022.

During the four months of practical training at Workline Engineering SDN. BHD. have learned how theory and practical can be combined together in useful ways and how remarkable and enjoyable practical training could be. While deadlines and skills are highly demanded, creativity is not limited and true innovation occurs throughout my practical training in Engineering of Electrical and Connection Cable As a result, I gained more knowledge and learned new things and most importantly I experienced the real working environment all by myself.

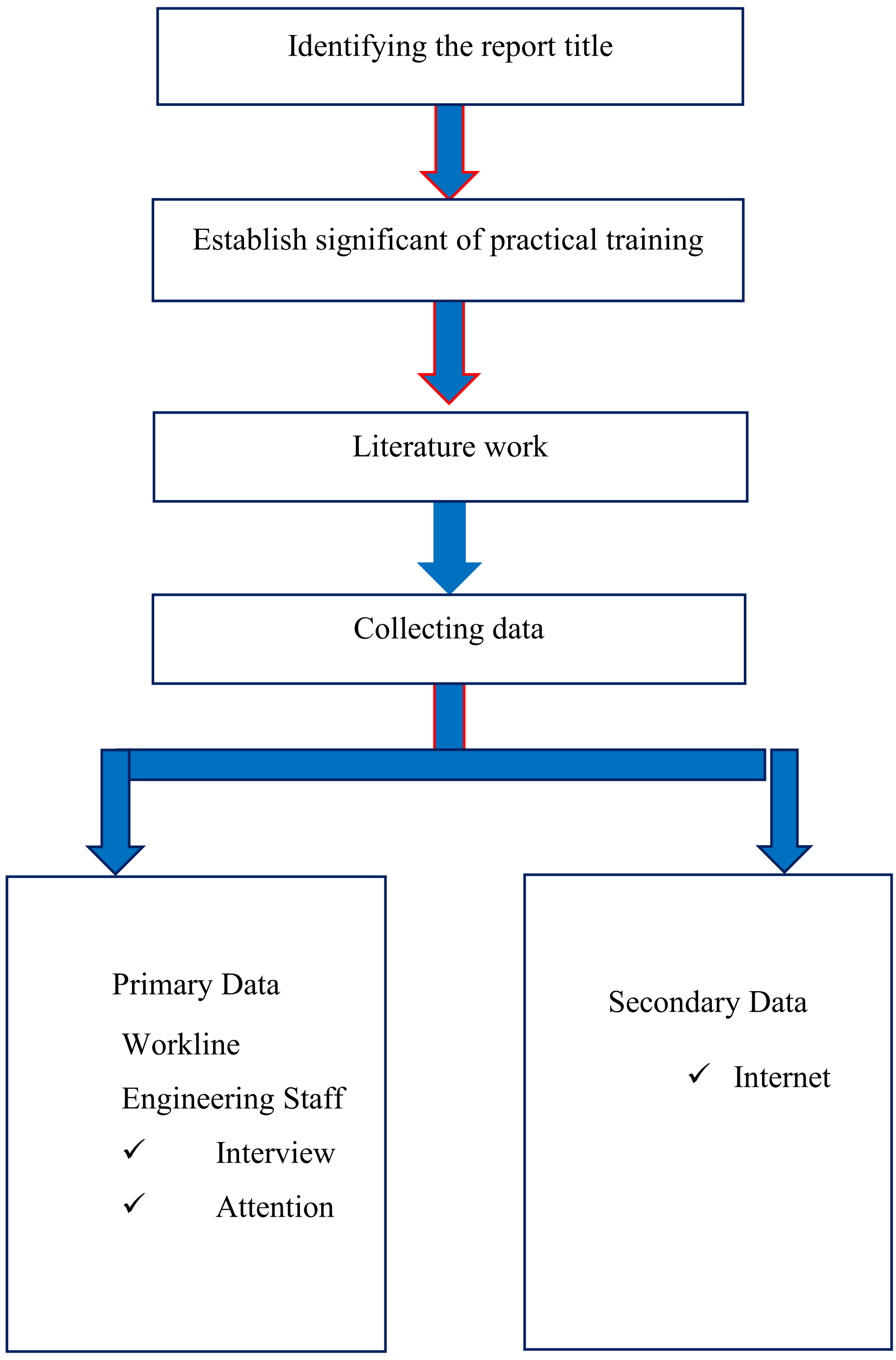
In term of relationship, I was lucky enough to work with a group of enthusiastic and communicative people, who for whatever reason willing to share their knowledge and experience of what they are doing. The experience gained has been an eye opening to me and I thoroughly recommend other students to do their industrial training at Workline Engineering SDN. BHD.

OBJECTIVE OF PRACTICAL TRAINING

The goal of Industrial Training is to prepare students to real-world work experiences while also providing them with information gained via hands-on observation and job performance. Students will gain skills in work ethics, communication, management, and other areas because of their industrial training. Furthermore, this hands-on training programme enables students to connect academic knowledge to real-world applications in the industrial business. The following are the goals of industrial training:

- To allow students to gauge their interest in a particular profession before making long-term commitments.
- To improve their ability to apply theory to real-world circumstances.
- To learn skills and strategies that will help them advance in their jobs.
- Internships will develop a student's feeling of responsibility and help them develop solid work attitudes.
- Students will be exposed to a real-world work setting and will get experience drafting reports for technical works/projects.
- To develop the students' strength, teamwork spirit, and self-confidence.
- To strengthen student's abilities to think creatively and share their thoughts.

METHODOLOGY OF REPORT



CHAPTER 1

INTRODUCTION

1.0 INTRODUCTION OF COMPANY

Figure 1 : Workline Engineering SDN.BHD.

WORKLINE ENGINEERING SDN BHD was incorporation in Malaysia under Act,1965 on 14 March 2011 as a private company.

Aiming to be the competitive Electrical Service provide, WORLINE ESSB is supported by experience professionals and skills workers from various field qualification, well equipped to take up the challenges and demands of today's robust market.

In order to ensure competitiveness of services , WORKLINE ESSB explores an open market with full commitment of providing quality service at a competitive price. The birth of WORKLINEESSB is a testimony of our desire to participate in the rapid economic activities.

1) The main specialization of WORKLINE ESSB includes the following :-

- Installation and commissioning of the Electrical Switchgear System.Installation, termination and jointing cable Electrical system form up 11KV,33KV and 132KV.

- Electrical equipment including switchgear, primary equipment such as current transformer, voltage transformer, laying power cable, circuit breaker, disconnector, earthing system, power transformer and IR Megger test 5KV.

2) Modification on control and protection system up to 11KV, 33KV and 132KV.
Electrical engineering design for protection and system up to 11KV, 33KV and 132KV system.

3) Install and apply fire retardant paint, coating, fire stopping material for cable entries into the building and into switchgear room, control room and battery room where applicable under the scope of work.

1.1 BUILDING BACKGROUND

Figure 2 : Workline Engineering SDN. BHD Office

Name	Workline Engineering SDN. BHD.
Building Status	Office
Address	3-15-2, Jalan Aman Damai G U17/G, Aman Putri Seksyen U17 , 40160 Shah Alam, Selangor.
Contact	03-60391377
Operation time	Monday-Sunday 9.00 a.m. to 5.00 p.m. (except for Friday, temporarily closed between 12.30 p.m. to 2.30 p.m.)

Table 1 : Building property information

1.2 Key plan, location plan and site plan

Key Plan

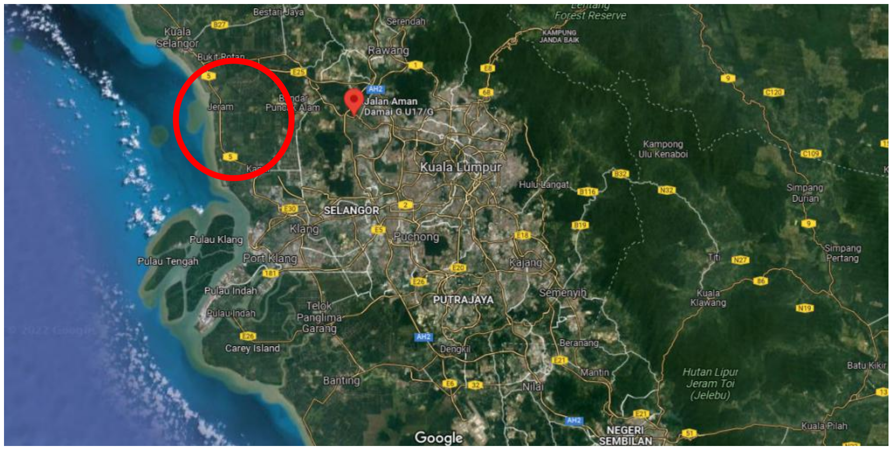


Figure 3 : Key Plan

Site Plan

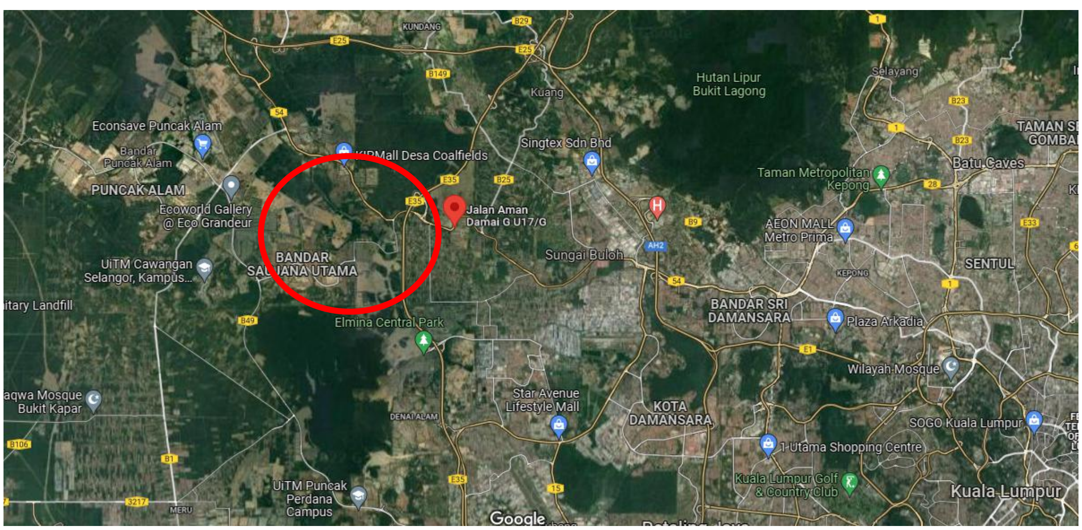


Figure 4: Area near the Pantai Hospital Manjung, Perak

Location plan

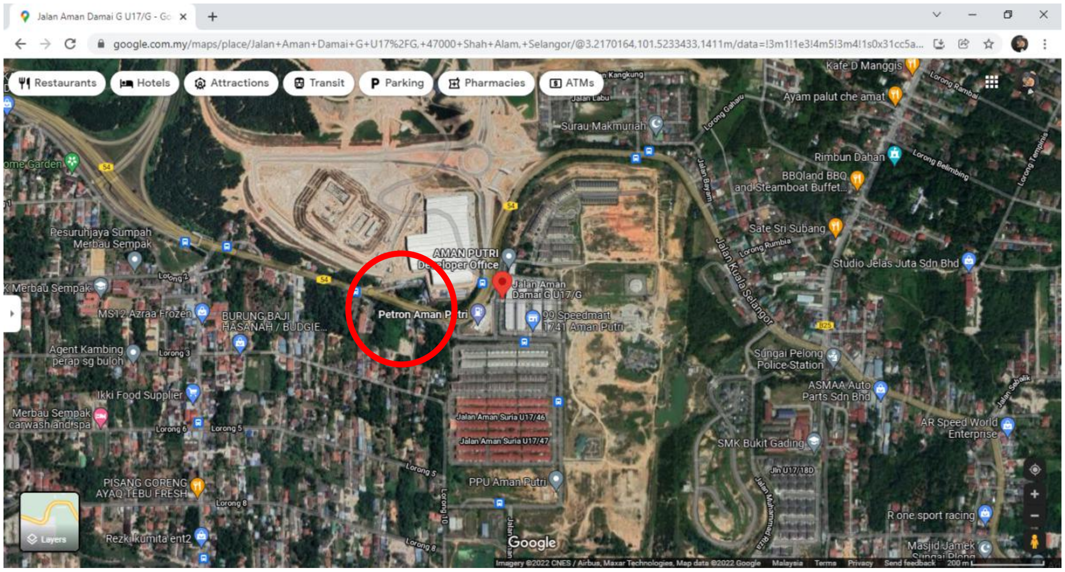


Figure 5: Location plan of Wokline Engineering

1.3 LOGO

Figure 6: Logo of Workline Ingineering SDN.BHD.

1.4 VISION

To become the market leader by repeatedly searching new solutions, methodologies and technology that will make the most of the quality and reliability of our services and providing supreme quality of our work, schedule and budget.

1.5 MISSION

To maintained good reputation with our customer and client by provide the highest quality services, flexibility and value. To prove our self as roll model by providing healthy, safe and secure working environment to our employees.

1.6 ORGANIZATION CHART OF THE WORKLINE ENGINEERING SDN. BHD BOARD

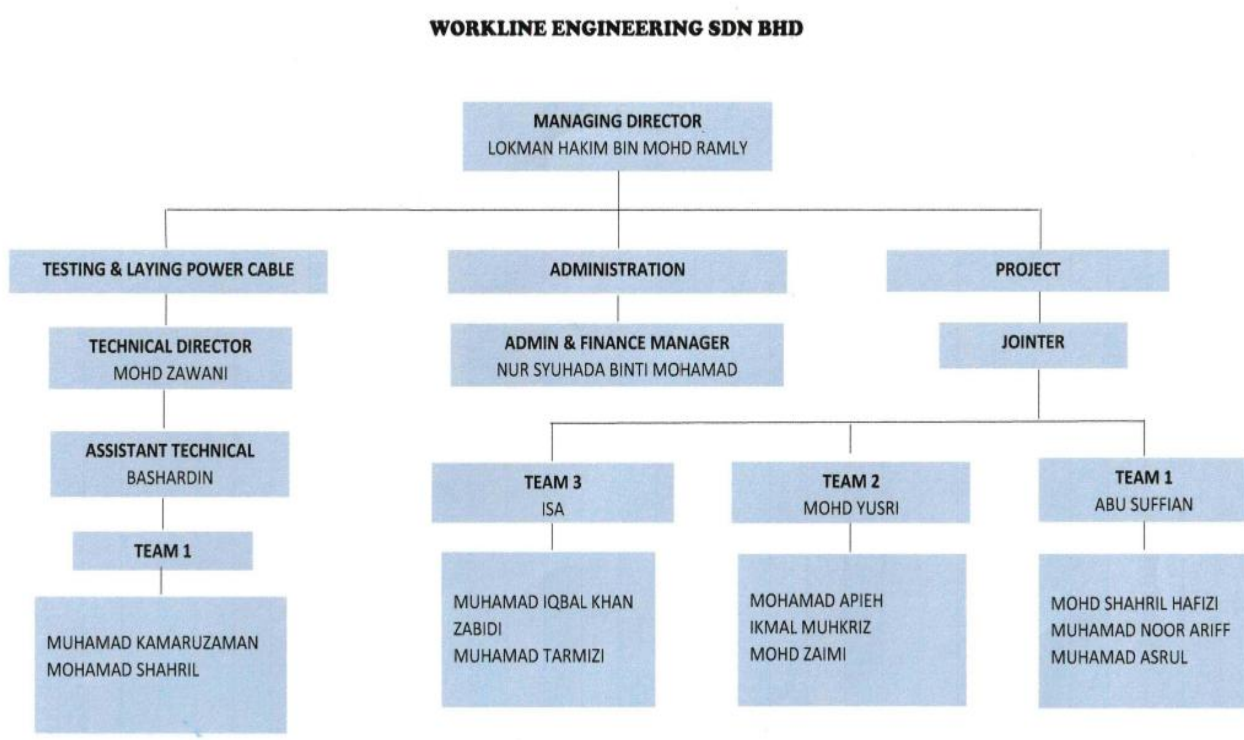


Table 2 : Organization Chart of Workline Engineering

1.7 PROJECT BRIEF

This project brief is describing the parties involve in pre-construction, during construction and past-construction.

PROJECT REFERENCE

PROJECT FOR ELECTRICAL INSTALLATION , JOINTING CABLE , TESTING MEGGER 5KV AND COMMISSIONING SUBSTATION & POWER STATION UP TO 132KV			
No	DESCRIPTION OF PROJECT	MAIN CONTRACTOR	DATE
1	TNB MOBILE SG RUSA , BALIK PULAU, PULAU PINANG.	I.A SERVICES SDN BHD	MAY 2016
	TNB BANGSAR , KUALA LUMPUR	A & A DINAR SDN BHD	MARCH 2016
	PMU BATU TIGA SHAH ALAM	A & A DINAR SDN BHGD	MAY 2016
	PMU HICOM G TO PMU PENAGA	A & A DINAR SDN BHD	MAY 2016
	PMU SOUTH KEE 132KV/33KV/11KV JOHOR.	NNS ENGINEERING SDN BHD	JUN 2016
	MICRON FAB 10X NO. 1 NORTH COAST DRIVE, SINGAPORE.	ACECS PTE LTD	SEP 2016
	PMU BUKIT MERAH , TAIPING , PERAK	I.A SERVICES SDN BHD	JUN 2016
	PMU BUKIT TENGAH P.PINANG	A & A DINAR SDN BHD	JULY 2016
	KULIM HITEC (NUR), KEDAH	A & A DINAR SDN BHD	JULY 2016
	DEPOT ROAD, SINGAPORE	A & A DINAR SDN BHD	JULY 2016
	T2 Transformer 11KV AT PMU BTGA	I.A SERVICES SDN BHD	NOV 2017
	SSU TUSOH TERENGGANU	ITEM INDUSTRIAL ENGINEERING SDN BHD	JAN 2017
	EXXONMOBIL, SINGAPORE	ACECS PTE LTD	JAN 2017
	TEMPORARY POWER SUPPLY, SAMSUNG PENGERANG , JOHOR .	SWISS RESOURCES SDN BHD	MARCH 2017
	SSU HICOM PASIR GUDANG JOHOR	ITEM INDUSTRIAN ENGINEERING SDN BHD.	APRIL 2017
	EXXON SJCP PROJECT JURONG , SINGAPORE	ACECS PTE LTD	APRIL 2017
	PENGERANG , JOHOR .	ACECS PTE LTD	APRIL 2017
	GOOGLE SATO KOGYO, SINGAPORE	ACECS PTE LTD	JULY 2017
	EXXONMOBIL SJCP PROJECT, JURONG.	ACECS PTE LTD	JULY 2017
	CHANGI WATER RECLAMATION PLANT	ACECS PTE LTD	JULY 2017
	TUDAN S/STATION 275KV, MIRI SERAWAK	A & A DINAR SDN BHD	NOV 2017
	PMU DANG WANGI , KUALA LUMPUR TRANSFORMER 90MVA T1 & T2	A & A DINAR SDN BHD	NOV 2017
	SURABAYA , CIBINONG JAKARTA INDONESIA	A & A DINAR SDN BHD	NOV 2017
	GOOGLE , SINGAPORE	ACECS PTE LTD	MARCH 2018
	CHANGI AIRPORT T5 RUNWAY,SINGAPORE	ACECS PTE LTD	NOV 2018
	PMU BAYAN MUTIARA , P.PINANG	A & A DINAR SDN BHD	MARCH 2018
	PPU LEMBAH SIRIH, KELANTAN.	ITEM INDUSTRIAL ENGINEERING SDN BHD	APRIL 2018
	PMU DANG WANGI 132LV/33KV/11KV	ITEM INDUSTRIAL ENGINEERING SDN BHD	FEB 2018
	PMU KL NORTH , SG BULOH	A & A DINAR SDN BHD	JUN 2018
	PMU SEBERANG JAYA , P.PINANG	ITEM INDUSTRIAL ENGINEERING SDN BHD	AUG 2018
	SUBSTATION SAMALAJU , BINTULU, SARAWAK	A & A DINAR SDN BHD	DEC 2018

	PMU PERLING 132KV /33KV/11KV , JOHOR	ITEM INDUSTRIAL ENGINEERING SDN BHD	MAY 2020
	PMU PASAK 132KV /33KV/11KV JOHOR	ITEM INDUSTRIAL ENGINEERING SDN BHD	JAN 2019
	PMU KL NORTH , SG BULOH TRANSFORMER TX1 , TX2 , TX3 & ETX 2	A & A DINAR SDN BHD	JAN 2019
	PMU TANJUNG BATU , PEKAN PAHANG .	ITEM INDUSTRIAL ENGINEERING SDN BHD	MAY 2019
	PMU SUNGAI KARANGAN KULIM , KEDAH	ITEM INDUSTRIAL ENGINEERING SDN BHD	SEP 2019
	PMU BANTING , SELANGOR	A & A DINAR SDN BHD	OCT 2019
	SOLAR FARM TO PMU SALING (JOHOR)	A & A DINAR SDN BHD	OCT 2019
	KTM SUBSTATION , KELUMPANG TG MALIM	A & A DINAR SDN BHD	OCT 2019
	SSU PAVILION 1 , BUKIT JALIL SSU PAVILION 2 , BUKIT JALIL PPU SG. MAGGIS , BANTING PPU BRISDALE , PANDAMARAN	BRY VISION ELECTRICAL	MARCH 2020
	PMU KALUMPANG , TANJUNG MALIM.	A & A DINAR SDN BHD	MAY 2020
	PE TAMAN WAWASAN, TANJUNG KARANG.	ITEM INDUSTRIAL ENGINEERING SDN BHD	JULY 2020
	33KV PERMANENT SUPPLY , PMC PENGGERANG	SWISS RESOURCES SDN BHD	OCT 2020
	PPU MELAWATI MALL	BRY VISION ELECTRICAL	OCT 2020
	SSU HOSPITAL , SERDANG	ITEM INDUSTRIAL ENGINEERING SDN BHD	DEC 2020
	MRN PROJEK DBKL	ITEM INDUSTRIAL ENGINEERING SDN BHD	DEC 2020
	PPU BOTANI IPOH PERAK	ITEM INDUSTRIAL ENGINEERING SDN BHD	DEC 2020
	PPU KOMTAR ,P.PINANG .	ITEM INDUSTRIAL ENGINEERING SDN BHD	JAN 2021
	SSU ALPHAPRISE	BRY VISION ELECTRICAL	FEB 2021
	PPU SG MANGGIS , BANTING	ITEM INDUSTRIAL ENGINEERING SDN BHD	FEB 2021
	SSU AJINOMOTO	ITEM INDUSTRIAL ENGINEERING SDN BHD	MARCH 2021
	SSU ISLAND , P.PINANG.	ITEM INDUSTRIAL ENGINEERING SDN BHD	APRIL 2021
	MRN PROJECT DBKL	ITEM INDUSTRIAL ENGINEERING SDN BHD	APRIL 2021
	PPU SEKINCHAN	BRY VISION ELECTRICAL	MAY 2021

Table 3 : Project Brief

This organization is a sub-company that accept projects from these list of companies, such as A & A Dinar SDN. BHD. and Item Industrial Engineering SDN. BHD. to do the electrical Tenaga Nasional Berhad (TNB) project.

1.8 SCOPE OF WORK ENGINEERING AND CONNECTION ELECTRICAL CABLE

There are many types of work that always did by Engineering and Connection Electrical Cable, such as :

- Designing and implementing work schedules for the electrical staff.
- Providing motivation and assistance when necessary.
- Inspecting and assessing the work done by the electrical staff.
- Reading and interpreting design schematics to ensure the proper installation of electrical systems.
- Troubleshooting major system failures and equipment malfunctions.
- Connection and maintaining electrical cable.
- Overseeing the purchasing and maintenance of the electrical equipment on-site.
- Ensuring the work is completed on schedule and to code.
- Maintaining a safe and clean work area.
- Consulting with builders, architects, and other workers on-site.

CHAPTER 2

LITERATURE RAVIEW

2.1 ELECTRIC

Electricity is a set of physical phenomena related to the presence and movement of matter that have the properties of an electric charge. Electricity is related to magnetism, both of which are part of the phenomenon of electromagnetism. Various common phenomena related to electricity, including lightning, static electricity, electric heating, electrical discharge and many more.

The presence of an electric charge, which can be either positive or negative, produces an electric field. The movement of an electric charge is an electric current and produces a magnetic field.

When a charge is placed in a location with a non -zero electric field, a force will act on it. The magnitude of this force is given by Coulomb's law. If the charge moves, the electric field will do the work on the electric charge. Thus we can speak of the electric potential at a particular point in space, which is similar to the work done by an external agent in carrying a unit of positive charge from an arbitrarily chosen reference point to that point without any acceleration and is usually measured in volts.

Electricity is at the heart of many modern technologies, electrical power in which an electric current is used to energize equipment;

Electronics dealing with electrical circuits involving active electrical components such as vacuum tubes, transistors, diodes and integrated circuits, and related passive connection technologies.

Electrical phenomena have been studied since ancient times, although progress in theoretical understanding remained slow until the seventeenth and eighteenth centuries. The theory of electromagnetism was developed in the 19th century, and by the end of that century electrical energy had been used for industrial and residential use by electrical engineers. The rapid development in electrical technology is currently transforming industry and society, becoming the driving force behind the Second Industrial Revolution. The incredible flexibility of electricity means it can be placed on an almost unlimited set of applications including transportation, heating, lighting, communication and computing. Electric power is now the backbone of modern industrial society.

2.2 High-voltage cable

A high-voltage cable (HV cable) is a cable used for high-voltage electric power transmission. A conductor and insulator make up a cable. Cables are thought to be completely insulated. This implies they have a complete insulation system that includes insulation, semi-conductor layers, and a metallic barrier.

An overhead line, on the other hand, may have insulation but is not completely qualified for operational voltage (EG: tree wire). Instruments, ignition systems, and alternating current (AC) and direct current (DC) power transmission are all applications for high-voltage cables of various sorts. The cable's insulation must not degrade owing to high-voltage stress, ozone created by electric discharges in the air, or tracking in any application. The cable system must keep the high-voltage conductor from coming into touch with other items or people, as well as contain and manage leakage current. To prevent insulation breakdown, cable couplings and terminals must be engineered to control high-voltage stress.

High-voltage cables come in a variety of cut lengths, ranging from a few feet to hundreds of feet, with shorter cables used in equipment and longer cables used within buildings or as underground cables in an industrial facility or for power distribution.

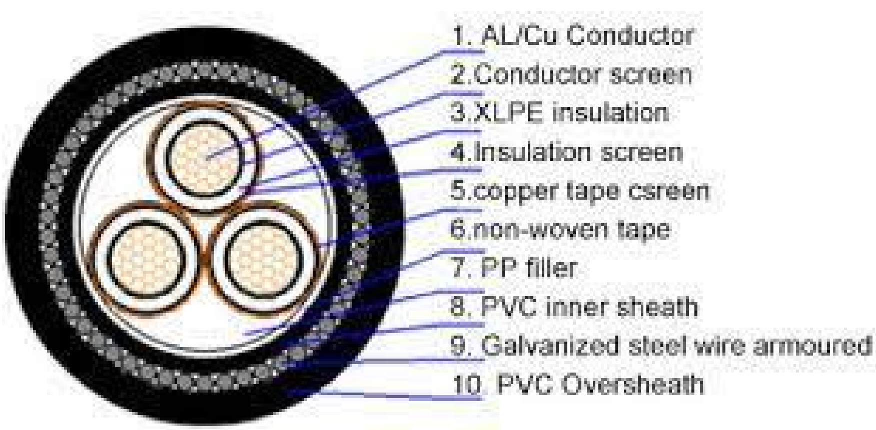


Figure 7 : Elements on electrical cable

The high-voltage cable have a three type for example, 11Kv, 33Kv, and 132Kv. This high-voltage cable supply electric power from TNB to the building and houses.

2.3 Electrical System

Voltages

The transmission voltage networks are 500kV, 275kV and 132kV, whilst the distribution voltages are 33kV, 11kV and 400/230 Volts. However, in the case of certain parts of Johor& Perak the distribution voltages may include 22kV and 6.6kV.

Supply Frequency

The supply frequency is 50Hz 1%.

Power Factor

Consumers are required to maintain their load power factor to a minimum of 0.85 for voltage level less than 132kV and 0.90 for voltage level 132kV and above.

Earthing System

High Voltage and Extra High Voltage

- 3 phase configuration
- Solidly earthed
- Overhead lines and underground cable are used extensively for high and extra highvoltage distribution

Medium Voltage

- 3 phase configuration
- Impedance-earth (NER)
- Overhead lines and underground cable are used extensively for medium voltage distribution

Low Voltage 400/230V

- 3 phase 4 wire system
- Neutral point solidly earthed mixture of overhead lines, underground cables and aerial insulated cables
- Mixture of overhead lines, underground cables and aerial insulated cables

Short Circuit Ratings

All equipment proposed to be installed and connected to TNB supply must comply with the following short circuit ratings:

	System	Short circuit rating
i.	500kV	50 kA, 1s
ii.	275kV	40 kA, 3s for bulk station (50kA , 1s for Power Substation and 275kV within 500kV substation)
iii.	132kV	31.5 kA, 3s (40kA, 3s for substation adjacent to Power Station, or within 500/275kV substation)

iv.	33kV	25 kA, 3s
v.	22kV	20 kA, 3s
vi.	11kV	20 kA, 3s
vii.	6.6kV	20 kA, 3s
viii.	400/230 V	31.5 kA, 3s

Act, Regulation and Customer Charter

The electricity supply and installation practice in Peninsular Malaysia are governed by the following:-

1	Electricity Supply Act 1990 – Act 447
2	Licensee Supply Regulations 1990
3	Electricity Regulations 1994
4	Customer Charter – refer to TNB website (www.tnb.com.my)

Supply Voltage Options

Supply may be provided at any of the declared voltages :-

275 kV, 132kV, 33kV, 22 kV*, 11kV, 6.6 kV* and 400/230V. Generally, supplies to domestic premises are given at single phase 2-wire or three phase 4-wire while for non domestic premises the supply are at three phase 3-wire or three phase 4-wire.

2.4 Cable Jointed

Low voltage, medium voltage, and high voltage cables are all connected by cable joints. There are various different types of joints, and the best one depends on the cable's size, form, and design, as well as the voltage rating, structure, insulation type, application, and number of cores to be joined.

The joint should offer electrical and mechanical insulation, and it may also need to act as a water barrier.

Welding, crimping, soldering, or mechanical connections can be used to connect the wires. Heat or cold shrinkable insulations, moulded kinds, or special tapes may be used as jointing insulation and shrouds over the conductors if they are compatible with the cable materials. The structure of the connector will be determined by whether a simple straight connection between two wires is desired.

2.5 Safety and Health on Site

The goal of this safety course is to give thorough on-site training to high-risk personnel (i.e., skilled trade and maintenance workers) and management in order to minimise major injuries caused by electrical hazards at their workplaces. Employees will learn how to detect electrical safety concerns in the workplace and how to mitigate or eliminate them. Electrical safety principles, employee qualification rules, work planning and management, and personal needs are all part of electrical safe work practises. For example, safety helmet , safety shoes and glove.

Section	Content	Objective
1	**Introduction to Electrical Safety**	Participants will be able to: • Explain the issues (statistics) associated with poor electrical safety in the workplace. • Recall key electrical terms which are essential to understanding and meeting the requirements of key electrical safety standards; i.e. OSHA 29 CFR 1910.331-.335, NFPA 70E, NEC (NFPA 70)

		• Define and differentiate between qualified and unqualified persons under OSHASub Part S. and the training requirements for each. • Describe the intent of an Electrical Safety Program and list the essential elements ofan effective program. • Use a "Status Check" survey to assess the facility's electrical safety program and where necessary develop strategies for improvement.

2	**Identifying theHazards**	Participants will be able to:
		• List types of electrical hazards to personnel and describe the nature of the hazardsrelated to:
		  ○ Electric shocks, arcs and blasts
		  ○ Fault current and potential difference
		  ○ Electrical safety in industrial plants
		• List the characteristics of an arc flash hazard
		• List the characteristics of an arc blast hazard
		• Explain how other injury hazards are related to shock, flash, and blast

3	**OSHA Requirements**	Participants will be able to: • Identify requirements specified in OSHA 29 CFR 1910.301-.308 and NFPA 70E-2004 Chapter 4 and describe similarities and differences in OSHA and 70E. • Explain how NFPA 70E is used in OSHA compliance and enforcement. • Determine training for workers in accordance with OSHA Sub Part S requirements. • Recall Safe Installation Practices including: ○ Guarding

		◦ Identification ◦ Flexible cords and cables ◦ System grounding ◦ Location of overcurrent protection devices ◦ Workspace clearance requirements • Assess an electrical installation for compliance with OSHA regulations. • Explain the reasons for doing a site assessment to determine arc flash hazardpotential for equipment and electrical enclosure.
4	**Safety Related WorkPractices**	Participants will be able to: • Identify requirements for electrical safe work practices specified in OSHA 29 CFR1910.331-.335 and NFPA 70E Chapter 1 • Define an "Electrically Safe Work Condition" and list specific steps to be taken to ensure an electrically safe work condition. • Explain how the creation of an electrically safe work condition can involve hazards

		and the methods to protect against them.
		• Describe the facility's lockout/tagout (LO/TO) procedure including requirementsand activities in the procedure and identify the persons responsible for each activity.
		• Determine the LO/TO procedure applicable to a given facility, operation, equipmentor activity.
		• Describe other safety related work practices to protect from electrical hazardsincluding:
		    o Selection and use of work practices
		    o De-energized work practices
		    o Energized work practices
		    o Approach boundaries and approach distances
		    o Requirements for use of test instruments and equipment
		    o Requirements for insulated tools
		    o Other equipment such as ladders, barricades, signs

5	**Working On or NearLive Parts**	Participants will be able to: • Identify persons who may be exposed to a source of electrical energy directly orindirectly. • List the conditions under which "hot work" is allowed. • Describe the purposes of an energized electrical work permit. • Recall three types of approach boundaries and define the dimensions of eachapproach boundary, given all necessary information. • Describe the essential parts of a Flash Hazard Analysis and list the data requiredanalysis.

		• List the information, including Hazard Risk Category, provided to a worker by aFlash Hazard Analysis and describe its use.
6	**Personal Protective Equipment (PPE)**	Participants will be able to: • List the basic types of personal protective equipment (PPE) for tasks involvingelectrical hazards. • Describe how each type protects against hazards and identify the limitations of PPE. • Explain the need for flame resistant (FR) clothing and layering of clothing forprotection and list clothing prohibited where electrical hazards are present. • Select PPE for a given Hazard Risk Category including gloves, eye, head, faceprotection and (FR) clothing. • Describe the requirements for use, care, maintenance and storage of PPE.

CHAPTER 3

CASE STUDY

(ELECTRICAL CONNECTION CABLE SERVICE)

3.1 Application Process (Technical and Financial Approval)

Application Process for Electricity Supply above 100 A as outlined in the table below. The process starts after the completion of Part A (Authorities Approval Process). The Process in Part B can be summarised as follows:

Stage	Description
1	**Submit Application** The Electrical Consultant Engineer (registered with Board of Engineers Malaysia) on behalf of the developer/consumer submits application for the Electricity Supply Application through myTNB portal and TNB Distribution Network Division Local Office. Complete details as in **Appendix 4** must be submitted with the application. TNB will issue an acknowledgement letter to the Electrical Consultant Engineer.
2	**Documentation Check And System Study** TNB will check on the documentation and carry out system studies and shall advise on the necessary amendments (if any) to the consultant by letter. The Electrical Consultant Engineer is to ensure that all the amendments are done and resubmitted to TNB.
3	**Joint Meeting** TNB will restudy the amendments and arrange for a joint meeting with the Electrical Consultant Engineer and Applicant for final acceptance of the technical requirements including substation details, cable/overhead line route, metering system requirements and meter location. Activities of both parties will be recorded in the

	Joint Meeting Action Log. TNB shall forward in writing the final proposal on the above agreed technical requirements to the Electrical Consultant/Applicant. Electrical Consultant on behalf of the Applicant shall in writing confirm acceptance of the final proposal to TNB.
4	**Connection Charges** TNB will issue a Notice of Connection Charges to the Electrical Consultant Engineer based on the accepted final proposal. The Electrical Consultant / Applicant shall make the payments for the Connection Charge.
5	**Electricity Infrastructure Agreement (Optional)** The applicant / TNB **may** decide to enter into an Electricity Infrastructure Agreement (mainly for large development) with regard to scope of work, charges, timely connection and their respective obligations.
6	**Discussion And Preparation Of Site Work** After payment of Connection Charges, the Electrical Consultant Engineer willarrange for pre start work discussion.

7	**Construction Completion And Substation Energising** The substation site and the construction of the substation building shall be completed (in accordance to TNB specification and requirement) and hand over to TNB. TNB will install the electrical equipment including its ancillaries and shall be responsible for the commissioning of substation.
8	**Meter Application By The Electrical Contractor** The Electrical Consultant Engineer shall advise the Electrical Contractor(Appointed by the Applicant) to submit meter application.
9	**Get Electricity Supply** The energising of supply by TNB will normally be done at the same time as theinstallation of the meters. For HV / MV supply, the supply shall be energised inthe presence of the Electrical Testing Engineer and for LV consumers in the presence of the Electrical Contractor.

During the industrial training at the Workline Engineering SDN. BHD, there are many electrical cable projects related to TNB that this organization take over such as in Jerteh, Terengganu involving the installment of the connection cable (33kv), at Batu Kawan, Penang (11kv), and in Alor Pongsu, Perak (132kv).

Steps for the installment of the connection cable :-

1) Testing the cable to ensure its functionality.

These tests are performed on apparatus that is expected to operate under direct voltage conditions, as well as where alternating voltage tests cannot be performed after installation due to the inconvenient use of high capacity transformers required for extra high tension alternating voltage tests and transportation difficulties. The testing of cables that are intended to operate under a.c. circumstances is a unique element of the d.c. test. If the tests are conducted in a.c., a large charging current will be drawn, necessitating the installation of a current-rated transformer. It is therefore common to expose the cable to a high voltage test under d.c. circumstances (shortly after laying it but before energising it). The voltage used in the test.The test voltage is around 2 (working voltage), and it is kept constant for 15 to 1.5 hours. This d.c. test is not completely equal to the corresponding a.c. circumstances; in this case, the voltage distribution is determined by the leakage resistance, but under a.c. settings, the voltage distribution is determined by the layers of various dielectrics. Despite the fact that the electric fields in the two scenarios are different, the wire is likely to withstand the needed a.c. voltage.

Figure 8 : Testing cable

2) setting cable for marking line and allow the cable to overlap to take the center joint.

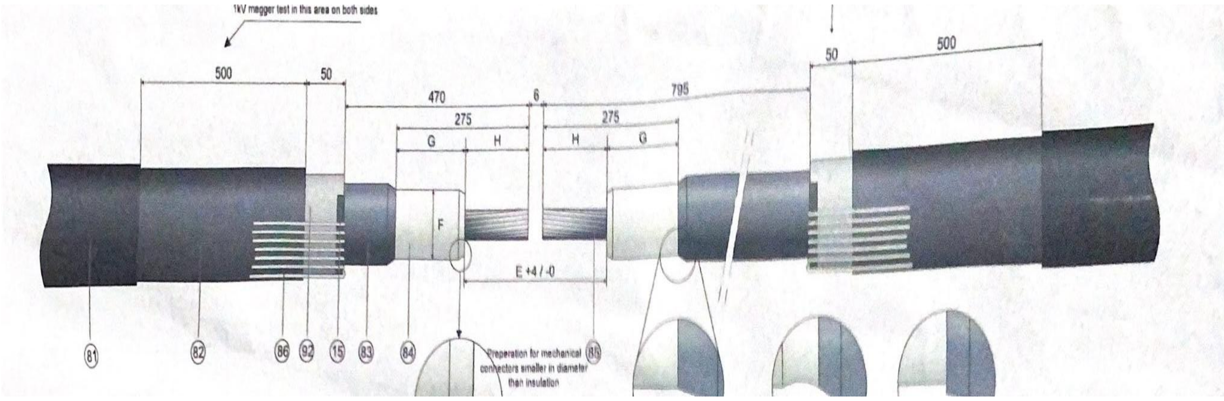


Figure 9 : Marking line of the cable

3) Then after marking it, the cable have to be prepared such as removing the outer layer and heating the cable. High voltage (HV) and ultra-high voltage UHV cables are very rigid. The inner wires of the high voltage cables have strong mechanical tensions. It is very difficult to bend this cable. Most of the time the cable is laid in a straight line underground. But it is sometimes necessary to bend the cable to follow a precise path, to make junctions or terminations. The solution is to pre-heat the cables prior to bending. The heat makes the inner wires and the complete cable more flexible. The operators can then bend the cable or start the connection.

Figure 10 : Heating cable process

4) After that joint body to connection the cable.

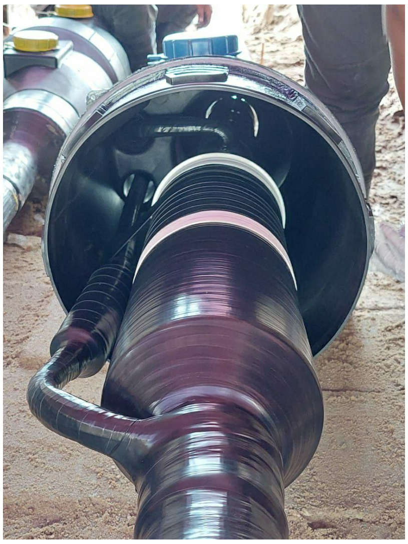


Figure 11 : Connection cable

5) Lastly, jointer make sure place of work clean and nothing deffect on cable after connection.

Figure 12 : Final of the connection cable

It will involve working in a team to achieve delivery of projects on time whilst adhering to all safety regulations, quality standards and project specifications. Then need maintenance when have any problem of the connection cable.

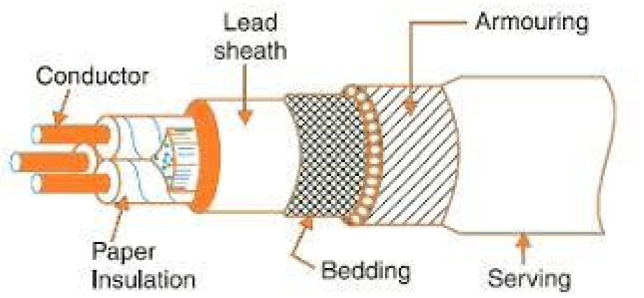


Figure 13 : Elements the high-voltage cable

Conductor - a conductive material that is constructed for the purpose of carrying electric current. a wire or cable, or other form of metal, installed for the purpose of conveying electric current from one piece of electrical equipment to another or to ground

Paper Insulation - Electrical insulation papers are paper types that are used as electrical insulation in many applications due to pure cellulose having outstanding electrical properties. Cellulose is a good insulator and is also polar, having a dielectric constant significantly greater than one.

Lead Sheath - the replacement of a lead sheath by an aluminium sheath with good corrosion protection, such as an extruded plastics oversheath, provides a very economic cable construction eliminating armour.

Bedding - is to protect the sheath from mechanical injury due to armouring.

Armoured - is used for submarine communications cable to protect against damage by fishing vessels and wildlife.

Serving - another layer of low grade insulator like Jute or Hessian or a thermoplastic compound like PVC is again provided to protect the steel from atmospheric contaminants and agents.

CHAPTER 4

DEFECTS ELECTRICAL CABLE

4.1 Analysis of Defects

Building defects is referred to as a construction flaw. It frequently results in an incomplete building that is less helpful than it was before. These defects include broken windows, missing decorations, and other problems. These defects are more likely to appear spontaneously after a structure has been standing for decades. Many faults, on the other hand, may usually be fixed to restore a component's full functionality.

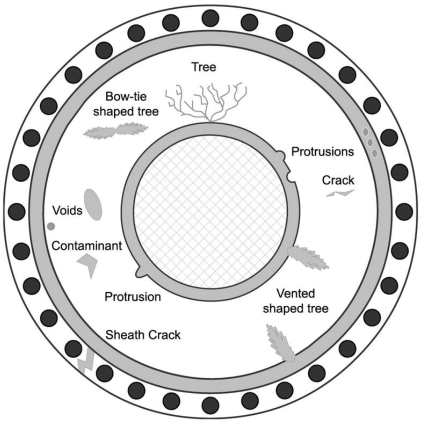


Figure 14 : Example defect on cable

The figure 13 show many defect on cable when making work by default. this is because, while in making the work of the cable connector should be meticulous and be careful. For example crack on cable can cause unstable electrical conduction and result in uneven and too strong cable vibration. therefore this matter will be the occurrence of an explosion or fire.

Figure 15 : The cable exploded

Solution for the defect on figure 14, cut the cable than change a new item and make sure no any defect on cable.

4.2 Problems on Site

Places of work generally have power nominally supplied at 230 volt (single phase) and 400 volt (3 phase) although some larger workplaces will receive electricity at a higher supply voltage. The information below relates to workplaces using 230 and 400 volt supplies.

The main hazards with electricity are:

- contact with live parts causing shock and burns
- faults which could cause fires;
- fire or explosion where electricity could be the source of ignition in a potentially flammable or explosive atmosphere, e.g. in a spray paint booth.

The risk of injury from electricity is strongly linked to where and how it is used and there is greater risk in wet and/or damp conditions.

4.3 Basics of Contact with Electricity

It is the level of voltage the body is exposed to and the resistance to flow of electrical current offered by the body that determines the impact of exposure to electricity. The following factors determine the severity of the effect electric shock has on your body:

- The level of voltage
- The amount of body resistance you have to the current flow
- The path the current takes through your body
- The length of time the current flows through your body

If a worker comes into touch with electricity, he or she may be unable to disconnect from the power source. The human body is an excellent electrical conductor. If you touch someone who is in contact with an electrical source, electricity will flow through your body, resulting in an electric shock. To begin, try to cut off the electrical source (disconnect). If the electrical source cannot be shut off quickly and securely, remove the individual from the electrical source using a non-conducting material such as a fibreglass object or a wooden pole.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

Conclusion

There is further potential for increasing the efficiency of electrical use, particularly in the residential and commercial sectors. The composition of national output changes in the composition of national output toward less electricity, intensive goods services have been offset by growth in the intensity of electricity use within all the major use sectors so that the combined effect on electricity demand growth has not yet been great. However, if the trend toward a leveling off in sector electricity intensity growth that began in the late 1970s continues, future shifts toward less electricity, intensive goods and services are likely to dampen electricity demand growth relative to national output.

Valid conclusions about electricity demand drawn from national data do not necessarily pertain to regional circumatances; there are significant regional differences in such factors as economic output, prices, electricity supply mix, availability of generating capacity, climate, and regulatory environment.With regard to economic activity, the regional factor important to electricity consumption include overall level of output, industry mix, labor and resource availability, and the relative importance of a region's commercial and industrial sectors. With regard to energy use, important regional factors include electricity and nonelectric energy prices, electricity supply mix, climate, and regulation. Shifts in demographic characteristics and regional activity may alter national electricity use patterns, although probably gradually and in a small way. National policy decisions should be sensitive to important regional differences.

Recommendations

To foster increased productivity, policy should stimulate increased efficiency of electricity use, promote the implementation of electrotechnologies when they are economically justified, and seek to lower the real costs of electricity supply by removing any regulatory impediments and developing promising technologies to provide electricity. The findings of this report establish a connection between electricity and productivity growth. The two factors that must coexist to realize the productivity growth associated with electricity are technical change and favorable electricity supply conditions.In addition, cost-effective increases in the efficiency of electricity use will themselves not only increase productive output for a given input of electricity but also free income for other purposes.These points suggest that federal and state policies that promote lowering the real costs of electricity supply and use, through research and development or through more efficient pricing by regulatory authorities, will benefit productivity growth.

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