

Powerline Technician

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Foreword

The Canadian Council of Directors of Apprenticeship (CCDA) recognizes this Interprovincial Program Guide (IPG) as the national curriculum for the occupation of Powerline Technician.

Jurisdictions have long recognized the benefit of pooling resources in the development and maintenance of apprenticeship training standards. A successful example of this is the Interprovincial Standards Red Seal Program itself. Essential to the establishment of standards is the development of suitable training systems and programs which enable tradespeople to acquire certification based on these standards. While certification is the responsibility of Apprenticeship administrators throughout Canada, the development and delivery of technical training is the responsibility of jurisdictions.

In 1999, work to develop common training for apprenticeship programs within the Atlantic Provinces began. To date, 22 Curriculum Standards have been developed through the Atlantic Standards Partnership (ASP) project to assist programming staff and instructors in the design and delivery of technical training. Similarly, the CCDA embarked on a process for the development of national IPGs for the Boilermaker, Carpenter and Sprinkler System Installer trades. At its January 2005 strategic planning session, the CCDA identified developing common training standards as one of the key activities in moving towards a more cohesive apprenticeship system.

With the support of Human Resources and Skills Development Canada (HRSDC), several provinces and territories have partnered to build on the ASP and the CCDA processes to further develop IPGs to be used across the country. This partnership will create efficiencies in time and resources and promote consistency in training and apprentice mobility.

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In addition to the representatives above, various federal, provincial and territorial representatives contributed to the development of this document including the host province of New Brunswick.

As this program guide will be amended periodically, comments or suggestions for improvement should be directed to:

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Table of Contents

Foreword	2
Acknowledgement.....	3
User Guide	5
IPG Glossary of Terms	7
Essential Skills Profiles.....	9
Profile Chart.....	10
Recommended Level Structure.....	12
2009 NOA Sub-Task to IPG Unit Comparison	13

PROGRAM CONTENT

Level 1.....	18
Level 2.....	46
Level 3.....	64
Level 4.....	76
Appendix: Recommended Level Structure (3 Year Apprenticeship).....	84

User Guide

According to the Canadian Apprenticeship Forum, the IPG is: "a list of validated technical training outcomes, based upon those sub-tasks identified as common core in the National Occupational Analysis (NOA), and validated by industry in the provinces and territories as incorporating the essential tasks, knowledge and skills associated with a given trade."

Learning outcomes contained in the IPG represent the minimum common core content for the development of jurisdictional training standards and outlines. IPGs are developed based on the NOAs and extensive industry consultation. The IPG is intended to assist program development staff in the design of jurisdictional plans of training. Each jurisdiction has the flexibility to add additional content.

The IPG was deliberately constructed for ease of use and flexibility of structure in order to adapt to all delivery requirements. It details units of training, unit outcomes and objectives. It does not impose a delivery model or teaching format.

Jurisdictions and/or training providers will select and develop delivery materials and techniques that accommodate a variety of learning styles and delivery patterns. The IPG does not dictate study materials, textbooks or learning activities to be used in delivery.

The IPG document includes a recommended levelling structure to facilitate mobility for apprentices moving from one jurisdiction to another. Because of difference in jurisdictional regulations and program durations, levels are offered as suggestions only.

Structure

The IPG is divided into units. The unit codes are used as a means of identification and are not intended to convey the order of delivery. Prerequisites have not been detailed. Each unit consists of *Learning Outcomes* and *Objectives and Content*.

The *Learning Outcomes* are the specific performances that must be evaluated. Wording of the learning outcomes, "Demonstrate knowledge of...", acknowledges the broad spectrum of ways in which knowledge can be shown. It is at the discretion of each jurisdiction to determine the manner in which learning outcomes are evaluated; theoretically, practically or a combination of both.

User Guide (*continued*)

The *Objectives and Content* for the unit details the information to be covered in order to achieve the performances specified in the *Learning Outcomes*. These objectives can be either theoretical or practical in nature, based on the requirements identified through the industry consultation process. The learning activities used to cover the objectives are at the discretion of the jurisdiction; however, practically worded objective statements have been used where industry indicated a need for the apprentices to receive exposure to performing the task or skill outlined while attending technical training. For example, this exposure could be done through instructor demonstration or individual or group performance of the skill or task. This practical training will help to reinforce the theoretical component of the technical training.

Detailed content for each objective has not been developed. Where detail is required for clarity, content has been provided. The content listed within the IPG document is **not** intended to represent an inclusive list; rather, it is included to illustrate the intended direction for the objective. Content may be added or extended in jurisdictional training plans as required.

Jurisdictions are free to deliver the IPG units one at a time or concurrently, provided that all *Learning Outcomes* are met. The IPG does not indicate the amount of time to be spent on a particular unit as the length of time required to deliver the *Learning Outcomes* successfully will depend upon the learning activities and teaching methods used.

IPG Glossary of Terms

These definitions are intended as a guide to how language is used in the IPGs.

APPLICATION	The use to which something is put and/or the circumstance in which you would use it.
CHARACTERISTIC	A feature that helps to identify, tell apart, or describe recognizably; a distinguishing mark or trait.
COMPONENT	A part that can be separated from or attached to a system; a segment or unit.
DEFINE	To state the meaning of (a word, phrase, etc.).
DESCRIBE	To give a verbal account of; tell about in detail.
EXPLAIN	To make plain or clear; illustrate; rationalize.
IDENTIFY	To point out or name objectives or types.
INTERPRET	To translate information from observation, charts, tables, graphs, and written material.
MAINTAIN	To keep in a condition of good repair or efficiency.
METHOD	A means or manner of doing something that has procedures attached to it.
OPERATE	How an object works; to control or direct the functioning of.
PROCEDURE	A prescribed series of steps taken to accomplish an end.
PURPOSE	The reason for which something exists or is done, made or used.

IPG Glossary of Terms *(continued)*

TEST

v. To subject to a procedure that ascertains effectiveness, value, proper function, or other quality.

n. A way of examining something to determine its characteristics or properties, or to determine whether or not it is working correctly.

TROUBLESHOOT

To follow a systematic procedure to identify and locate a problem or malfunction and its cause.

Essential Skills Profiles

Essential Skills are the skills needed for work, learning and life. They provide the foundation for learning all the other skills that enable people to evolve within their jobs and adapt to workplace change.

Over the past several years, the Government of Canada has conducted research examining the skills people use at work. From this research, Essential Skills Profiles have been developed for various occupations.

For more information regarding Essential Skills and to access Essential Skills Profiles for specific occupations, visit Human Resources and Skills Development Canada's Essential Skills website at:

<http://www.hrsdc.gc.ca/eng/workplaceskills/LES/profiles/profiles.shtml>

Profile Chart

OCCUPATIONAL SKILLS			
PLT-100 Safety	PLT-105 Tools and Equipment	PLT-110 Access Equipment	PLT-115 Pole Climbing
PLT-400 Steel Structure Climbing	PLT-120 Rigging, Hoisting and Lifting	PLT-125 Aerial Devices and Hydraulics	PLT-130 On- and Off-road Equipment
PLT-135 Introduction to Communication and Trade Documentation	PLT-200 Drawings, Schematics and Specifications	PLT-405 Job Planning	PLT-140 Traffic Control
PLT-240 Live Line Work			
STRUCTURES			
PLT-165 Grounding and Bonding	PLT-185 Overhead Distribution Structures	PLT-420 Transmission Structures	
CONDUCTOR SYSTEMS			
PLT-170 Conductors and Cables	PLT-175 Sagging Conductors	PLT-415 Transmission Systems	
AUXILIARY EQUIPMENT			
PLT-215 Inductance and Capacitance	PLT-220 Transformers	PLT-300 Transformer Banking	PLT-305 Power Transformers
PLT-245 Single-Phase Metering	PLT-315 Three-Phase Metering	PLT-320 Voltage Regulation and Control Devices	PLT-325 Line Protective Devices
PLT-330 Line Capacitors	PLT-250 Street Lighting Systems		

Profile Chart *(continued)*

OPERATION, MAINTENANCE AND REPAIR			
PLT-410 Tree Trimming	PLT-145 Power and Energy	PLT-150 DC Theory	PLT-155 DC Circuits
PLT-160 AC Theory	PLT-205 AC Circuits	PLT-210 Series and Parallel Circuits	PLT-180 Single-Phase Circuits
PLT-310 Three-Phase Circuits	PLT-225 Distribution Lines	PLT-230 Overhead Distribution Systems	PLT-235 Underground Distribution Systems
PLT-425 Substations, Switching Stations and Terminals			

Recommended Level Structure

LEVEL 1					
Unit Code	Title	Page	Unit Code	Title	Page
PLT-100	Safety	18	PLT-145	Power and Energy	32
PLT-105	Tools and Equipment	20	PLT-150	DC Theory	33
PLT-110	Access Equipment	21	PLT-155	DC Circuits	35
PLT-115	Pole Climbing	22	PLT-160	AC Theory	36
PLT-120	Rigging, Hoisting and Lifting	23	PLT-165	Grounding and Bonding	37
PLT-125	Aerial Devices and Hydraulics	25	PLT-170	Conductors and Cables	38
PLT-130	On- and Off- Road Equipment	27	PLT-175	Sagging Conductors	40
PLT-135	Introduction to Communication and Trade Documentation	29	PLT-180	Single-Phase Circuits	41
PLT-140	Traffic Control	31	PLT-185	Overhead Distribution Structures	42
LEVEL 2					
Unit Code	Title	Page	Unit Code	Title	Page
PLT-200	Drawings, Schematics and Specifications	46	PLT-230	Overhead Distribution Systems	54
PLT-205	AC Circuits	47	PLT-235	Underground Distribution Systems	56
PLT-210	Series and Parallel Circuits	48	PLT-240	Live Line Work	58
PLT-215	Inductance and Capacitance	49	PLT-245	Single-Phase Metering	59
PLT-220	Transformers	50	PLT-250	Street Lighting Systems	60
PLT-225	Distribution Lines	52			
LEVEL 3					
Unit Code	Title	Page	Unit Code	Title	Page
PLT-300	Transformer Banking	64	PLT-320	Voltage Regulation and Control Devices	69
PLT-305	Power Transformers	66	PLT-325	Line Protective Devices	71
PLT-310	Three-Phase Circuits	67	PLT-330	Line Capacitors	73
PLT-315	Three-Phase Metering	68			
LEVEL 4					
Unit Code	Title	Page	Unit Code	Title	Page
PLT-400	Steel Structure Climbing	76	PLT-415	Transmission Systems	79
PLT-405	Job Planning	77	PLT-420	Transmission Structures	80
PLT-410	Tree Trimming	78	PLT-425	Substations, Switching Stations and Terminals	81

2009 NOA Sub-task to IPG Unit Comparison

NOA Sub-task		IPG Unit	
Task 1 - Uses and maintains tools and equipment.			
1.01	Maintains hand tools.	PLT-105	Tools and Equipment
1.02	Maintains power tools.	PLT-105	Tools and Equipment
1.03	Maintains powder-actuated tools.	PLT-105	Tools and Equipment
1.04	Maintains electrical measuring and testing equipment.	PLT-105	Tools and Equipment
1.05	Uses climbing gear.	PLT-115	Pole Climbing
		PLT-400	Steel Structure Climbing
1.06	Uses on- and off-road equipment.	PLT-130	On- and Off-road Equipment
1.07	Uses access equipment.	PLT-110	Access Equipment
1.08	Uses rigging, hoisting and lifting equipment.	PLT-120	Rigging, Hoisting and Lifting
1.09	Uses personal protective equipment (PPE) and safety equipment.	PLT-100	Safety
Task 2 - Communicates in the workplace.			
2.01	Communicates verbally.	PLT-135	Introduction to Communication and Trade Documentation
2.02	Communicates using hand signals.	PLT-120	Rigging, Hoisting and Lifting
		PLT-135	Introduction to Communication and Trade Documentation
2.03	Communicates electronically.	PLT-135	Introduction to Communication and Trade Documentation
Task 3 - Organizes work.			
3.01	Interprets codes, regulations and procedures.	PLT-135	Introduction to Communication and Trade Documentation
3.02	Interprets plans, drawings and specifications.	PLT-200	Drawings, Schematics and Specifications
3.03	Uses documentation and reference material.	PLT-135	Introduction to Communication and Trade Documentation
		PLT-200	Drawings, Schematics and Specifications
3.04	Prepares worksite.	PLT-100	Safety
		PLT-405	Job Planning
3.05	Plans job tasks and procedures.	PLT-405	Job Planning
Task 4 - Establishes safe work environment.			
4.01	Identifies powerline hazards.	PLT-100	Safety
4.02	Controls powerline hazards.	PLT-100	Safety

NOA Sub-task		IPG Unit	
		PLT-240	Live Line Work
4.03	Controls environmental hazards.	PLT-100	Safety
Task 5 - Uses live-line methods.			
5.01	Uses cover-up.	PLT-240	Live Line Work
5.02	Uses rubber gloves.	PLT-240	Live Line Work
5.03	Uses bare-hand methods.	PLT-240	Live Line Work
5.04	Uses fibreglass reinforced plastic (FRP) tools (sticks).	PLT-240	Live Line Work
Task 6 - Installs poles.			
6.01	Selects poles.	PLT-185	Overhead Distribution Structures
6.02	Frames poles.	PLT-185	Overhead Distribution Structures
6.03	Sets poles.	PLT-185	Overhead Distribution Structures
6.04	Installs pole guys and anchors.	PLT-185	Overhead Distribution Structures
Task 7 - Installs steel structures.			
7.01	Installs footings. (NOT COMMON CORE)		
7.02	Assembles steel structures.	PLT-420	Transmission Structures
7.03	Erects steel structures.	PLT-420	Transmission Structures
7.04	Installs steel structure guy wires and anchors.	PLT-420	Transmission Structures
Task 8 - Installs overhead conductors.			
8.01	Strings overhead conductors.	PLT-170	Conductors and Cables
		PLT-415	Transmission Systems
		PLT-225	Distribution Lines
8.02	Sags overhead conductors.	PLT-175	Sagging Conductors
8.03	Ties-in overhead conductors.	PLT-170	Conductors and Cables
		PLT-225	Distribution Lines
8.04	Splices overhead conductors.	PLT-170	Conductors and Cables
Task 9 - Installs underground and marine cable.			
9.01	Installs conduit systems. (NOT COMMON CORE)		
9.02	Places underground and marine cable.	PLT-170	Conductors and Cables
		PLT-235	Underground Distribution Systems
9.03	Splices underground and marine cable.	PLT-170	Conductors and Cables
		PLT-235	Underground Distribution Systems

NOA Sub-task		IPG Unit	
9.04	Terminates underground and marine cable.	PLT-170	Conductors and Cables
		PLT-235	Underground Distribution Systems
Task 10 - Installs lighting systems.			
10.01	Installs street lights.	PLT-250	Street Lighting Systems
10.02	Maintains street lights.	PLT-250	Street Lighting Systems
Task 11 - Installs voltage control equipment.			
11.01	Installs transformers.	PLT-220	Transformers
		PLT-300	Transformer Banking
		PLT-305	Power Transformers
11.02	Installs capacitors.	PLT-330	Line Capacitors
11.03	Installs voltage regulators.	PLT-320	Voltage Regulation and Control Devices
11.04	Installs switches.	PLT-325	Line Protective Devices
11.05	Installs reactors. (NOT COMMON CORE)		
Task 12 - Installs protection equipment.			
12.01	Installs reclosers.	PLT-325	Line Protective Devices
12.02	Installs sectionalizers.	PLT-325	Line Protective Devices
12.03	Installs fuses.	PLT-325	Line Protective Devices
12.04	Installs lightning arrestors.	PLT-325	Line Protective Devices
Task 13 - Installs metering equipment.			
13.01	Installs primary metering.	PLT-245	Single-Phase Metering
		PLT-315	Three-Phase Metering
13.02	Installs secondary metering.	PLT-245	Single-Phase Metering
		PLT-315	Three-Phase Metering
Task 14 - Operates distribution and transmission systems.			
14.01	Operates overhead and underground transmission systems.	PLT-415	Transmission Systems
14.02	Operates overhead and underground distribution systems.	PLT-230	Overhead Distribution Systems
		PLT-235	Underground Distribution Systems
Task 15 - Maintains distribution and transmission systems.			
15.01	Inspects distribution and transmission systems.	PLT-415	Transmission Systems
		PLT-230	Overhead Distribution Systems
		PLT-235	Underground Distribution Systems
15.02	Maintains poles.	PLT-230	Overhead Distribution Systems
15.03	Maintains steel structures.	PLT-420	Transmission Structures

NOA Sub-task		IPG Unit	
15.04	Maintains system components.	PLT-220	Transformers
		PLT-305	Power Transformers
		PLT-170	Conductors and Cables
		PLT-245	Single-Phase Metering
		PLT-315	Three-Phase Metering
		PLT-320	Voltage Regulation and Control Devices
		PLT-325	Line Protective Devices
		PLT-330	Line Capacitors
		PLT-425	Substations, Switching Stations and Terminals
15.05	Trims trees.	PLT-410	Tree Trimming
Task 16 - Repairs distribution systems.			
16.01	Troubleshoots overhead distribution systems.	PLT-230	Overhead Distribution Systems
16.02	Troubleshoots underground distribution systems.	PLT-235	Underground Distribution Systems
16.03	Repairs overhead distribution systems.	PLT-230	Overhead Distribution Systems
16.04	Repairs underground distribution systems.	PLT-235	Underground Distribution Systems
Task 17 - Repairs transmission systems.			
17.01	Troubleshoots overhead transmission systems.	PLT-415	Transmission Systems
17.02	Troubleshoots underground transmission systems.	PLT-415	Transmission Systems
17.03	Repairs overhead transmission systems.	PLT-415	Transmission Systems
17.04	Repairs underground transmission systems.	PLT-415	Transmission Systems

LEVEL 1

Learning Outcomes:

- Demonstrate knowledge of safety equipment, their applications, maintenance and procedures for use.
- Demonstrate knowledge of safe work practices.
- Demonstrate knowledge of regulatory requirements pertaining to safety.

Objectives and Content:

1. Identify types of personal protective equipment (PPE) and clothing and describe their applications and limitations.
2. Describe the procedures used to care for and maintain PPE.
3. Identify hazards and describe safe work practices.
 - i) personal
 - ii) workplace
 - biohazards (used needles)
 - energy state awareness (electrical and mechanical)
 - arc flash awareness
 - isolation and de-energizing procedures
 - equi-potential grounding and bonding
 - lockout / tag out
 - confined space awareness
 - rescue procedures
 - fire
 - heights
 - fall prevention and arrest
 - rescue procedures
 - chemical / gas / radiation
 - asbestos
 - iii) environmental
 - discharge/spills
4. Identify and describe workplace safety and health regulations.
 - i) federal
 - Material Safety Data Sheets (MSDS)
 - Workplace Hazardous Material Information System (WHMIS)

- Transportation of Dangerous Goods (TDG)
- ii) provincial/territorial
 - Occupational Health and Safety (OH&S)
- iii) municipal

PLT-105 Tools and Equipment

Learning Outcomes:

- Demonstrate knowledge of tools and equipment, their applications, maintenance and procedures for use.

Objectives and Content:

1. Identify types of hand tools and describe their applications and procedures for use.
2. Describe the procedures used to inspect and maintain hand tools.
3. Identify types of power tools and describe their applications and procedures for use.
 - i) electric (corded/cordless)
 - ii) hydraulic
 - iii) pneumatic
 - iv) gas powered
 - v) powder actuated
4. Describe the procedures used to inspect and maintain power tools.
5. Identify types of basic electrical measuring and test equipment and describe their general applications.
6. Describe the procedures used to inspect and maintain electrical measuring and test equipment.

PLT-110 Access Equipment

Learning Outcomes:

- Demonstrate knowledge of ladders, their applications, limitations and procedures for use.

Objectives and Content:

1. Define terminology associated with ladders.
2. Identify hazards and describe safe work practices pertaining to ladders.
 - i) fall prevention and arrest
3. Identify codes and regulations pertaining to ladders.
4. Identify types of ladders and describe their characteristics and applications.
5. Describe the procedures used to erect and remove ladders.
6. Describe the procedures used to inspect, maintain, transport and store ladders.

PLT-115 Pole Climbing

Learning Outcomes:

- Demonstrate knowledge of pole climbing, its applications, limitations and procedures for use.
- Demonstrate knowledge of pole climbing equipment, its applications, limitations and procedures for use.

Objectives and Content:

1. Define terminology associated with pole climbing and equipment.
2. Identify hazards and describe safe work practices pertaining to pole climbing and equipment.
 - i) fall prevention and arrest
3. Describe the procedures used to perform pole top rescues.
4. Identify codes and regulations pertaining to pole climbing equipment.
 - i) training and certification requirements
5. Identify types of pole climbing equipment and describe their characteristics and applications.
6. Identify pole climbing equipment components and describe their characteristics and applications.
 - i) spurs
 - ii) belts
 - iii) pole straps
7. Describe the procedures used to climb using climbing equipment.
8. Describe the procedures used to inspect, maintain and store climbing equipment and components.

Learning Outcomes:

- Demonstrate knowledge of rigging, hoisting and lifting equipment, their applications, limitations and procedures for use.
- Demonstrate knowledge of basic rigging, hoisting and lifting techniques.

Objectives and Content:

1. Define terminology associated with rigging, hoisting and lifting.
2. Identify hazards and describe safe work practices pertaining to rigging, hoisting and lifting.
3. Identify codes and regulations pertaining to rigging, hoisting and lifting.
 - i) training and certification requirements
4. Interpret information pertaining to rigging, hoisting and lifting found on drawings and specifications.
5. Identify types of rigging, hoisting and lifting equipment and accessories and describe their applications and procedures for use.
 - i) slings
 - ii) wire/conductor grips
 - iii) shackles
 - iv) ropes
 - v) cables
 - vi) levers
 - vii) pullers
 - viii) block and tackles
6. Identify types of knots, hitches, splices and bends and describe their applications and the procedures used to tie them.
7. Describe the considerations when rigging, hoisting and lifting material/equipment.
 - i) load characteristics
 - ii) equipment and accessories
 - iii) anchor points
 - iv) sling angles

8. Describe the procedures used when rigging, hoisting and lifting material/equipment.

Learning Outcomes:

- Demonstrate knowledge of aerial devices, their applications and operation.
- Demonstrate knowledge of basic hydraulic principles.
- Demonstrate knowledge of hydraulic equipment components, their applications and operation.

Objectives and Content:

1. Define terminology associated with aerial devices.
2. Identify types of aerial devices and describe their applications.
 - i) material handling
 - ii) personnel lift
 - iii) radial boom derricks
3. Identify hazards and describe safe work practices pertaining to aerial devices.
 - i) working load limits (WLL) and safe working loads (SWL)
 - ii) use of outriggers
4. Describe the procedures used to perform bucket evacuations and rescues.
5. Interpret codes, standards and regulations pertaining to aerial devices.
 - i) training, certification and licensing requirements
6. Interpret information pertaining to aerial devices and hydraulic equipment found on drawings and specifications.
7. Identify tools and equipment relating to aerial devices and describe their applications and procedures for use.
8. Identify aerial device components and describe their functions.
9. Explain basic hydraulic principles and their applications relating to aerial devices.

10. Identify hydraulic equipment components and describe their purpose and operation.
 - i) hydraulic cylinders
 - ii) hydraulic valves
 - iii) hydraulic hoses
 - iv) hydraulic reservoirs
11. Describe the procedures used to ensure the work area is safe for operating aerial devices.
 - i) supervision
 - ii) securing work area
 - iii) communication
 - hand signals (awareness of)
 - electronic communications
 - audible/visual
12. Describe the procedures used to operate aerial devices.

Learning Outcomes:

- Demonstrate knowledge of on- and off-road equipment, their applications, maintenance and operating procedures.

Objectives and Content:

1. Define terminology associated with on- and off-road equipment.
2. Identify types of on- and off-road equipment and describe their characteristics and applications.
 - i) bucket trucks
 - material handling
 - personnel lift
 - ii) radial boom derricks
 - iii) off-road track machines
 - iv) hydro-vacuum excavators
 - v) all-terrain vehicles
3. Identify hazards and describe safe work practices pertaining to on- and off-road equipment.
4. Interpret codes, standards and regulations pertaining to on- and off-road equipment.
 - i) training, certification and licensing requirements
5. Interpret information pertaining to on- and off-road equipment found in specifications.
 - i) load charts
 - ii) working load limits (WLL)/ safe working loads (SWL)
6. Identify tools and equipment relating to on- and off-road equipment and describe their applications and procedures for use.
7. Identify on- and off-road equipment components and accessories and describe their characteristics and applications.

8. Describe the procedures used to inspect and maintain on- and off-road equipment.
9. Describe the procedures used to operate on- and off-road equipment.

PLT-135 Introduction to Communication and Trade Documentation

Learning Outcomes:

- Demonstrate knowledge of effective communication practices.
- Demonstrate knowledge of trade related documentation and its use.
- Demonstrate knowledge of jurisdictional and company policies.

Objectives and Content:

1. Identify audiences and describe techniques for effective verbal and non-verbal communication.
 - i) apprentices
 - ii) other tradespersons
 - iii) colleagues
 - iv) supervisors
 - v) clients
2. Use effective verbal and non-verbal communication.
3. Identify types of trade related documentation and describe their purpose, applications and procedures for use.
 - i) manufacturers' specifications
 - ii) codes and standards
 - iii) work orders
 - iv) maintenance schedules
 - v) maintenance records
 - vi) safety manuals
4. Identify types of written reporting and describe their purpose and applications.
 - i) clearance reports
 - ii) vehicle and driver logs
 - iii) time and material records
 - iv) apprentice training logs
 - v) risk assessment forms (tailboard)

5. Identify types of communication devices and describe their purpose and operation.
- i) two-way radios
 - ii) cellular phones and mobility devices
 - iii) computers
 - iv) satellite phones

PLT-140 Traffic Control

Learning Outcomes:

- Demonstrate knowledge of traffic control equipment, their applications, maintenance and procedures for use.
- Demonstrate knowledge of traffic control techniques and procedures.

Objectives and Content:

1. Define terminology associated with traffic control.
2. Identify hazards and describe safe work practices pertaining to traffic control.
3. Interpret codes, standards and regulations pertaining to traffic control.
 - i) highway safety legislation
4. Identify tools and equipment relating to traffic control and describe their applications and procedures for use.
5. Identify the techniques used to control traffic.
6. Describe the procedures used to control traffic.

PLT-145 Power and Energy

Learning Outcomes:

- Demonstrate knowledge of power and energy, their characteristics and associated principles.
- Demonstrate knowledge of units of measure and symbols relating power and energy.
- Demonstrate knowledge of the instruments and procedures used to measure power and energy.

Objectives and Content:

1. Define terminology associated with power and energy.
2. Explain mechanical power and energy.
 - i) force
 - ii) work
 - iii) power
 - iv) horsepower
 - v) energy
3. Explain electrical power and energy.
 - i) watt
 - ii) kilowatt
 - iii) kilowatt hour
4. Explain principles of efficiency.
5. Identify units of measure and symbols pertaining to power and energy.
6. Identify instruments used for measuring power and energy and describe their applications and procedures for use.
7. Perform calculations to determine power and energy related values.

PLT-150 DC Theory

Learning Outcomes:

- Demonstrate knowledge of direct current (DC) electricity, its characteristics and associated principles.
- Demonstrate knowledge of Ohm's law.
- Demonstrate knowledge of units of measure and symbols relating to DC electricity.
- Demonstrate knowledge of the instruments and procedures used to measure electricity.

Objectives and Content:

1. Define terminology associated with DC electricity.
2. Explain the atomic structure of matter and electron theory.
 - i) conductors
 - ii) semi-conductors
 - iii) insulators
3. Identify the forms of energy that produce electricity and describe their associated principles.
 - i) chemical action
 - ii) piezoelectric effect (pressure)
 - iii) mechanical/magnetism
 - iv) heat
 - v) light and solar
 - vi) friction
4. Describe basic electric circuits.
 - i) electron path (conductors)
 - ii) load
 - iii) source
 - iv) control
 - v) current flow
 - vi) closed circuit
 - vii) open circuit
 - viii) short circuit

5. Identify basic components found in DC electric circuits and describe their characteristics and purpose.
6. Identify units of measure and symbols pertaining to DC electricity.
7. Explain Ohm's Law.
8. Identify the basic electrical properties and describe their relationship.
 - i) voltage
 - ii) current
 - iii) resistance
 - iv) power
9. Identify instruments used for measuring electricity and describe their applications and procedures for use.
 - i) voltmeter
 - ii) ammeter
 - iii) ohmmeter
10. Perform calculations to determine electricity and power related values.

Learning Outcomes:

- Demonstrate knowledge of DC circuits, their characteristics and operation.
- Demonstrate knowledge of the procedures used to troubleshoot DC circuits.
- Demonstrate knowledge of the procedures used to analyze and measure DC circuit values.

Objectives and Content:

1. Define terminology associated with DC circuits.
2. Explain the characteristics and operation of DC circuits.
3. Identify hazards and describe safe practices pertaining to DC electricity.
4. Identify types of DC circuits and describe their characteristics and operation.
 - i) series-parallel
 - ii) combination
5. Interpret information pertaining to DC circuits found on drawings and specifications.
6. Perform calculations to analyze and measure DC circuit related values.
 - i) amperage
 - ii) voltage
 - iii) resistance/continuity
 - iv) power consumption
7. Describe the procedures used to troubleshoot DC circuits.
8. Use instruments to troubleshoot DC circuits.

Learning Outcomes:

- Demonstrate knowledge of alternating current (AC) electricity, its characteristics and associated principles.
- Demonstrate knowledge of units of measure and symbols relating to AC electricity.
- Demonstrate knowledge of the instruments and procedures used to measure electricity.

Objectives and Content:

1. Define terminology associated with AC electricity.
2. Explain alternating current (AC).
3. Identify types of components found in AC circuits and describe their characteristics and applications.
 - i) resistors
 - ii) inductors
 - iii) capacitors
4. Identify units of measure and symbols pertaining to AC electricity.
5. Identify electrical properties and describe their relationship.
 - i) magnetism
 - ii) electromagnetism
6. Identify instruments used for measuring electricity and describe their applications and procedures for use.
7. Explain the generation of alternating current.
8. Perform calculations to determine electricity and power related values.

PLT-165 Grounding and Bonding

Learning Outcomes:

- Demonstrate knowledge of grounding and bonding methods and equipment.
- Demonstrate knowledge of the procedures used to install, inspect and maintain grounding and bonding systems.

Objectives and Content:

1. Define terminology associated with grounding and bonding.
2. Identify hazards and describe safe work practices pertaining to grounding and bonding.
3. Interpret codes, standards and regulations pertaining to grounding and bonding.
4. Interpret information pertaining to grounding and bonding found on drawings and specifications.
5. Identify tools and equipment relating to grounding and bonding and describe their applications and procedures for use.
6. Identify methods of grounding and bonding.
7. Describe the theory for equi-potential grounding and bonding.
8. Identify grounding and bonding conductors (jumpers), equipment and components and describe their characteristics and applications.
9. Identify the considerations and requirements for selecting grounding and bonding conductors (jumpers), methods, equipment and components.
10. Describe the procedures used to install grounding and bonding systems.
11. Describe the procedures used to inspect and maintain grounding and bonding systems.

Learning Outcomes:

- Demonstrate knowledge of conductors and cables and their associated components.
- Demonstrate knowledge of methods of cable protection and their applications.
- Demonstrate knowledge of the procedures used to mechanically protect and support cables.

Objectives and Content:

1. Define terminology associated with conductors and cables.
2. Identify hazards and describe safe work practices pertaining to conductors and cables.
3. Interpret utility standards pertaining to conductors and cables.
4. Interpret information pertaining to conductors and cables found on drawings and specifications.
5. Identify tools and equipment relating to conductors and cables and describe their applications and procedures for use.
6. Identify types of conductors and cables and describe their characteristics and applications.
 - i) overhead
 - ii) underground
 - iii) marine
 - iv) transmission
7. Identify conductor and cable components and accessories and describe their characteristics and applications.
8. Identify methods of cable protection and describe their characteristics and applications.
 - i) mechanical
 - ii) electrical

9. Describe the procedures used to provide mechanical protection and support for cables.
10. Identify the considerations and requirements for selecting conductors and cables and their associated components and accessories.

PLT-175 Sagging Conductors

Learning Outcomes:

- Demonstrate knowledge of the effects of sagging on conductors.
- Demonstrate knowledge of the procedures used to sag conductors.

Objectives and Content:

1. Define terminology associated with sagging conductors.
2. Identify hazards and describe safe work practices pertaining to sagging conductors.
3. Interpret codes, standards and regulations pertaining to sagging conductors.
4. Interpret information and perform calculations pertaining to sagging conductors found on drawings and specifications.
 - i) sag charts
 - ii) weights and tensions
5. Identify tools and equipment relating to sagging conductors and describe their applications and procedures for use.
6. Explain the effects of sagging on conductors.
7. Identify types and sizes of conductors and describe their characteristics and applications.
8. Identify the considerations and requirements for selecting dead-ends for conductors.
9. Describe the procedures used to sag conductors.

Learning Outcomes:

- Demonstrate knowledge of single-phase circuits, their characteristics and operation.
- Demonstrate knowledge of electromagnetic induction, its characteristics and applications.

Objectives and Content:

1. Define terminology associated with single-phase circuits.
2. Identify hazards and describe safe work practices pertaining to single-phase circuits.
3. Identify units of measure and symbols pertaining to single-phase circuits.
4. Identify the components of single-phase circuits and describe their applications and operation.
5. Explain electromagnetic induction and its effect on a circuit.
 - i) self induction
 - ii) mutual induction
6. Perform calculations pertaining to single-phase circuits.

Learning Outcomes:

- Demonstrate knowledge of distribution structures, their components and applications.
- Demonstrate knowledge of electrical distribution principles.
- Demonstrate knowledge of the procedures used to install and remove distribution structures, their components and accessories.
- Demonstrate knowledge of the procedures used to inspect, maintain, repair and test distribution structures.

Objectives and Content:

1. Define terminology associated with distribution structures.
2. Identify hazards and describe safe work practices pertaining to distribution structures.
3. Interpret codes, standards and regulations pertaining to distribution structures.
4. Interpret information pertaining to distribution structures found on drawings and specifications.
5. Identify tools and equipment relating to distribution structures and describe their applications and procedures for use.
6. Identify types of distribution structures and describe their characteristics and applications.
 - i) single pole (with conductors only)
 - ii) tangent
 - iii) angle
 - iv) dead-end
 - v) take-off (or tap)
 - vi) joint use construction
 - vii) self-supporting poles
 - wood
 - steel
 - fibreglass
 - concrete
 - laminate

7. Identify distribution structure components and accessories and describe their characteristics and applications.
8. Identify types of distribution system components.
 - i) pole mounted transformers
 - ii) single-phase and three-phase switching points
 - iii) capacitor banks
 - iv) regulator banks
 - v) reclosers
9. Describe the procedures used to install and remove distribution structures, their components and accessories.
10. Describe the procedures used to repair and test distribution structures, their components and accessories.
11. Describe the procedures used to inspect and maintain distribution structures, their components and accessories.

LEVEL 2

Learning Outcomes:

- Demonstrate knowledge of drawings, schematics and specifications and their applications.
- Demonstrate knowledge of interpreting and extracting information from drawings, basic schematics and specifications.

Objectives and Content:

1. Define terminology associated with drawings, schematics and specifications.
2. Identify types of drawings and describe their applications.
 - i) electrical
 - ii) construction standards
3. Interpret and extract information from drawings.
 - i) symbols and abbreviations
4. Interpret and extract information from basic schematics and specifications.

Learning Outcomes:

- Demonstrate knowledge of AC circuits, their characteristics and operation.
- Demonstrate knowledge of the procedures used to troubleshoot AC circuits.
- Demonstrate knowledge of the procedures used to analyze and measure AC circuit values.

Objectives and Content:

1. Define terminology associated with AC circuits.
2. Explain the characteristics and operation of AC circuits.
3. Identify hazards and describe safe work practices pertaining to AC electricity.
4. Identify types of AC circuits and describe their characteristics and operation.
 - i) series-parallel
 - ii) combination
5. Interpret information pertaining to AC circuits found on drawings and specifications.
6. Perform calculations to analyze and measure AC circuit related values.
 - i) voltage
 - ii) current
 - iii) impedance
7. Explain vector representation as it applies to analyzing AC circuits.
8. Describe the procedures used to troubleshoot AC circuits.
9. Use instruments to troubleshoot AC circuits.

Learning Outcomes:

- Demonstrate knowledge of series, parallel and combination circuits, their characteristics and operation.

Objectives and Content:

1. Define terminology associated with series and parallel circuits.
2. Identify hazards and describe safe work practices pertaining to series and parallel circuits.
3. Explain the characteristics and operation of series circuits.
4. Explain the characteristics and operation of parallel circuits.
5. Explain the characteristics and operation of combination circuits.
6. Perform calculations to determine series, parallel and combination circuit related values.
7. Describe the procedures used to troubleshoot series, parallel and combination circuits.

PLT-215 Inductance and Capacitance

Learning Outcomes:

- Demonstrate knowledge of inductance and capacitance, their characteristics and associated principles.
- Demonstrate knowledge of how inductance and capacitance are encountered on the job.

Objectives and Content:

1. Define terminology associated with inductance and capacitance.
2. Identify hazards and describe safe work practices pertaining to inductance and capacitance.
3. Explain the principles of inductance and capacitance.
4. Describe the importance of inductance and capacitance in AC circuits.
 - i) series circuits
 - ii) parallel circuits
 - iii) combination circuits
5. Identify the effects of inductance and capacitance on transmission and distribution lines.
 - i) skin effect
 - ii) mutual induction
 - iii) capacitive reactance
 - iv) conductor impedance
 - v) inductive reactance
6. Explain the effects of resonance as it pertains to inductance and capacitance.

PLT-220 Transformers

Learning Outcomes:

- Demonstrate knowledge of transformer operating principles.
- Demonstrate knowledge of transformer components, their applications and operation.
- Demonstrate knowledge of the procedures used to install and maintain transformers.
- Demonstrate knowledge of managing hazardous materials associated with transformers.

Objectives and Content:

1. Define terminology associated with transformers.
2. Identify hazards and describe safe work practices pertaining to transformers.
3. Interpret codes, standards and regulations pertaining to transformers.
4. Interpret information pertaining to transformers found on nameplates, drawings and specifications.
5. Identify tools and equipment relating to transformers and describe their applications and procedures for use.
6. Identify types of transformers and describe their applications.
7. Identify transformer components and describe their purpose and operation.
 - i) core
 - ii) windings
 - iii) oil
 - iv) bushings
 - v) gaskets
 - vi) tank
 - vii) cover
 - viii) taps and tap changer
 - ix) mounting brackets
 - x) switches

8. Explain transformer operating principles and their applications.
9. Perform transformer load calculations.
10. Describe the procedures used for paralleling single-phase transformers.
11. Explain transformer fusing principles and their applications relating to single-phase transformation.
12. Describe the procedures used to install and maintain transformers.
13. Describe the procedures used to manage oils and other petroleum products pertaining to transformers.

Learning Outcomes:

- Demonstrate knowledge of primary and secondary distribution lines, their applications and operation.
- Demonstrate knowledge of primary and secondary distribution line components, their applications and operation.
- Demonstrate knowledge of the procedures used to install, inspect, maintain, repair, troubleshoot and test distribution lines.

Objectives and Content:

1. Define terminology associated with distribution lines.
2. Identify hazards and describe safe work practices pertaining to distribution lines.
3. Interpret codes, standards and regulations pertaining to distribution lines.
4. Interpret information pertaining to distribution lines found on drawings and specifications.
5. Identify tools and equipment relating to distribution lines and describe their applications and procedures for use.
6. Explain the principles of electrical distribution.
7. Identify types of electrical distribution systems and describe their characteristics and applications.
8. Identify distribution line components and describe their purpose and operation.
9. Describe the procedures used to install primary and secondary lines and their components.
 - i) conventional stringing (slack)
 - ii) non-conventional stringing (tension)
10. Describe the procedures used to inspect and maintain primary and secondary distribution lines and their components.

11. Describe the procedures used to troubleshoot primary and secondary distribution lines.
12. Describe the procedures used to repair and test primary and secondary distribution lines and their components.
13. Describe basic distribution line design theory.
14. Identify basic electrical design requirements of primary and secondary distribution lines.

Learning Outcomes:

- Demonstrate knowledge of overhead systems, their characteristics and applications.
- Demonstrate knowledge of overhead system construction principles.
- Demonstrate knowledge of the procedures used to install, connect, inspect, maintain, repair, troubleshoot and test overhead system components and accessories.

Objectives and Content:

1. Define terminology associated with overhead systems.
2. Identify hazards and describe safe work practices pertaining to overhead systems.
3. Interpret codes, standards and regulations pertaining to overhead systems.
4. Interpret information pertaining to overhead systems found on drawings and specifications.
5. Identify tools and equipment relating to overhead systems and describe their applications and procedures for use.
6. Identify types of overhead systems and describe their applications.
7. Identify components and accessories used in overhead systems and describe their characteristics and applications.
 - i) transformers
 - ii) reclosers
 - iii) capacitors
 - iv) conductors
 - v) system grounds
 - vi) voltage regulators
8. Explain the principles of overhead system construction.
9. Describe the operating procedures for overhead systems.

10. Describe the procedures used to install and connect overhead systems, their components and accessories.
11. Describe the procedures used to troubleshoot overhead systems, their components and accessories.
12. Describe the procedures used to inspect and maintain overhead systems, their components and accessories.
13. Describe the procedures used to repair and test overhead systems, their components and accessories.

Learning Outcomes:

- Demonstrate knowledge of underground systems, their characteristics and applications.
- Demonstrate knowledge of underground system construction principles.
- Demonstrate knowledge of the procedures used to install, splice and terminate conductors and cables.
- Demonstrate knowledge of the procedures used to install, connect, inspect maintain, troubleshoot, repair and test underground system components and accessories.

Objectives and Content:

1. Define terminology associated with underground systems.
2. Identify hazards and describe safe work practices pertaining to underground systems.
3. Interpret codes, standards and regulations pertaining to underground systems.
4. Interpret information pertaining to underground systems found on drawings and specifications.
5. Identify tools and equipment relating to underground systems and describe their applications and procedures for use.
6. Identify types of underground systems and describe their applications.
 - i) radial
 - ii) loop
 - iii) network
7. Identify components and accessories used in underground systems and describe their characteristics and applications.
 - i) cables
 - concentric neutral
 - non-shielded
 - shielded
 - ii) cable protection

- iii) handling cable
 - iv) system grounds
 - v) duct systems
 - vi) direct-buried systems
 - vii) pad-mounted transformers
8. Explain the principles of underground system construction.
 9. Describe the operating procedures for underground systems.
 10. Describe the procedures used to install and connect underground systems, their components and accessories.
 11. Describe the procedures used to troubleshoot underground systems, their components and accessories.
 12. Describe the procedures used to inspect and maintain underground systems, their components and accessories.
 13. Describe the procedures used to repair and test underground systems, their components and accessories.
 14. Describe the procedures used to fish and install conductors and cables and their associated components and accessories.
 15. Describe the procedures used to splice conductors and cables.
 16. Describe the procedures used to cut, strip and terminate conductors and cables.

Learning Outcomes:

- Demonstrate knowledge of the principles of live line work.
- Demonstrate knowledge of the procedures used to perform live line work.

Objectives and Content:

1. Define terminology associated with live line work.
2. Identify hazards and describe safe work practices pertaining to live line work.
3. Interpret codes, standards and regulations pertaining to live line work.
4. Interpret information pertaining to live line work found on drawings and specifications.
5. Identify tools and equipment used for live line work and describe their applications and procedures for use.
 - i) rigging
 - ii) tension stringing equipment
6. Interpret information and perform calculations pertaining to live line rigging.
 - i) weights and tensions
 - ii) working load limits (WLL)/ safe working loads (SWL)
7. Identify types of live line work and describe their applications.
 - i) hot stick
 - ii) rubber glove
 - iii) bare hand
8. Identify line protection requirements relating to live line work.
9. Describe principles of live line work.
10. Describe the procedures used to perform live line work.
 - i) cover-up

PLT-245 Single-Phase Metering

Learning Outcomes:

- Demonstrate knowledge of single-phase meters, their components and applications.
- Demonstrate knowledge of metering procedures.
- Demonstrate knowledge of the procedures used to remove and install single-phase meters.

Objectives and Content:

1. Define terminology associated with single-phase meters.
2. Identify hazards and describe safe work practices pertaining to single-phase meters.
3. Interpret codes, standards and regulations pertaining to single-phase meters.
4. Interpret information pertaining to single-phase meters found on drawings and specifications.
5. Identify tools and equipment relating to single-phase meters and describe their applications and procedures for use.
6. Identify types of single-phase meters and describe their applications.
 - i) primary
 - ii) secondary
 - iii) self-contained
 - iv) transformer rated
7. Identify single-phase meter components and describe their functions.
8. Explain single-phase metering procedures.
9. Describe the procedures used to remove and install single-phase meters.

Learning Outcomes:

- Demonstrate knowledge of street lighting systems, their characteristics and applications.
- Demonstrate knowledge of the procedures used to install, connect, troubleshoot, inspect, maintain, repair and test street lighting systems.
- Demonstrate knowledge of the procedures used to store and dispose of ballasts, capacitors and lamps.

Objectives and Content:

1. Define terminology associated with street lighting systems.
2. Identify hazards and describe safe work practices pertaining to street lighting systems.
3. Interpret codes, standards and regulations pertaining to street lighting systems.
4. Interpret information pertaining to street lighting systems found on drawings and specifications.
5. Identify tools and equipment relating to street lighting systems and describe their applications and procedures for use.
6. Identify types of street lighting systems and describe their characteristics and applications.
7. Identify street lighting system components and accessories and describe their characteristics and applications.
8. Identify considerations and requirements for selecting street lighting system components and accessories.
9. Describe the procedures used to install and connect street lighting systems, their components and accessories.
10. Describe the procedures used to troubleshoot street lighting systems, their components and accessories.

11. Describe the procedures used to inspect and maintain street lighting systems, their components and accessories.
12. Describe the procedures used to repair and test street lighting systems, their components and accessories.
13. Identify the hazards associated with the storage and disposal of ballasts, capacitors and lamps.
14. Describe the procedures used to store and dispose of ballasts, capacitors and lamps.

LEVEL 3

PLT-300 Transformer Banking

Learning Outcomes:

- Demonstrate knowledge of transformer connection types, their applications and implications.
- Demonstrate knowledge of transformer fusing principles.
- Demonstrate knowledge of the procedures used to install, parallel and test transformer banks.

Objectives and Content:

1. Define terminology associated with transformer banking.
2. Identify hazards and describe safe work practices pertaining to transformer banking.
3. Interpret codes, standards and regulations pertaining to transformer banking.
4. Interpret information pertaining to transformer banking found on nameplates, drawings and specifications.
5. Identify tools and equipment relating to transformer banking and describe their applications and procedures for use.
6. Identify the considerations for selecting transformers to satisfy clients' needs.
7. Identify types of transformer connections and describe their applications.
 - i) delta-delta
 - ii) wye-wye
 - iii) delta-wye
 - iv) wye-delta
 - v) open wye-open delta
8. Explain transformer fusing principles and their applications relating to transformer banking.
9. Describe the procedures used for paralleling three-phase transformer banks.
10. Describe the procedures used to install transformer banks.

11. Identify types of tests pertaining to transformer banking.
 - i) phase rotation
12. Describe the procedures used to perform tests on transformer banks.

PLT-305 Power Transformers

Learning Outcomes:

- Demonstrate knowledge of power transformer operating principles.
- Demonstrate knowledge of power transformer components, their applications and operation.
- Demonstrate knowledge of the procedures used to install, inspect and maintain power transformers.

Objectives and Content:

1. Define terminology associated with power transformers.
2. Identify hazards and describe safe work practices pertaining to power transformers.
3. Interpret codes, standards and regulations pertaining to power transformers.
4. Interpret information pertaining to power transformers found on nameplates, drawings and specifications.
5. Identify tools and equipment relating to power transformers and describe their applications and procedures for use.
6. Identify types of power transformers and describe their applications.
 - i) stationary
 - ii) mobile
7. Identify power transformer components and describe their functions.
8. Identify types of power transformer connections and describe their applications.
 - i) two-winding
 - ii) autotransformer
 - iii) tertiary
9. Explain power transformer operating principles and their applications.
10. Describe the procedures used to install power transformers.
11. Describe the procedures used to inspect and maintain power transformers.

Learning Outcomes:

- Demonstrate knowledge of three-phase circuits, their characteristics and applications.
- Demonstrate knowledge of three-phase connections.
- Demonstrate knowledge of three-phase electricity calculations.

Objectives and Content:

1. Define terminology associated with three-phase circuits.
2. Identify hazards and describe safe work practices pertaining to three-phase circuits.
3. Identify units of measure and symbols pertaining to three-phase power.
4. Explain three-phase power generation.
5. Identify the components of three-phase circuits and describe their applications and operation.
6. Identify types of three-phase connections and describe their applications and operation.
 - i) delta
 - ii) wye
7. Explain the relationship between voltage and current in three-phase connections.
8. Describe the procedures used to measure three-phase power.
9. Perform calculations for balanced and unbalanced loads.
10. Perform calculations pertaining to three-phase power.
 - i) true power
 - ii) apparent power
 - iii) reactive power
 - iv) power factor

PLT-315 Three-Phase Metering

Learning Outcomes:

- Demonstrate knowledge of three-phase meters, their components and applications.
- Demonstrate knowledge of metering procedures.
- Demonstrate knowledge of the procedures used to remove and install three-phase meters.

Objectives and Content:

1. Define terminology associated with three-phase meters.
2. Identify hazards and describe safe work practices pertaining to three-phase meters.
3. Interpret codes, standards and regulations pertaining to three-phase meters.
4. Interpret information pertaining to three-phase meters found on drawings and specifications.
5. Identify tools and equipment relating to three-phase meters and describe their applications and procedures for use.
6. Identify types of three-phase meters and describe their applications.
 - i) primary
 - ii) secondary
 - iii) self-contained
 - iv) transformer rated
 - current transformers (CT)
 - potential transformers (PT)
 - test switches
7. Identify three-phase meter components and describe their functions.
8. Explain three-phase metering procedures.
9. Describe the procedures used to remove and install three-phase meters.

Learning Outcomes:

- Demonstrate knowledge of voltage regulation and control devices, their characteristics and applications.
- Demonstrate knowledge of the procedures used to install and operate voltage regulation and control devices.

Objectives and Content:

1. Define terminology associated with voltage regulation and control devices.
2. Identify hazards and describe safe work practices pertaining to voltage regulation and control devices.
3. Interpret codes, standards and regulations pertaining to voltage regulation and control devices.
4. Interpret information pertaining to voltage regulation and control devices found on drawings and specifications.
5. Identify tools and equipment relating to voltage regulation and control devices and describe their applications and procedures for use.
6. Identify voltage regulation and control devices and accessories and describe their characteristics and applications.
 - i) shunt capacitors
 - ii) series capacitors
 - iii) tap changers
 - on-load
 - off-load
 - iv) voltage regulators
 - induction
 - step
 - v) auto boosters
7. Identify the considerations and requirements for selecting voltage regulation devices and accessories.

8. Describe the procedures used to install and operate voltage regulation and control devices, their components and accessories.

PLT-325 Line Protective Devices

Learning Outcomes:

- Demonstrate knowledge of protective devices, their characteristics and applications.
- Demonstrate knowledge of operating principles of protective devices.
- Demonstrate knowledge of the procedures used to install, operate, troubleshoot and inspect protective devices.

Objectives and Content:

1. Define terminology associated with protective devices.
2. Identify hazards and describe safe work practices pertaining to protective devices and those contained in substations.
3. Interpret codes, standards and regulations pertaining to protective devices.
4. Interpret information pertaining to protective devices found on drawings and specifications.
5. Identify tools and equipment relating to protective devices and describe their applications and procedures for use.
6. Identify types of protective devices and describe their characteristics and applications.
 - i) air break devices (load breaking and non-load breaking)
 - fuses
 - power fuses
 - ii) oil devices
 - iii) vacuum devices
 - iv) de-ionizing gas devices (SF₆, circuit breaker)
 - v) lightning arrestors
 - vi) current limiting fuses
7. Identify protective device components and accessories and describe their characteristics and applications.
8. Explain the operating principles of protective devices.

9. Explain protective principles and their applications relating to line protection.
10. Explain the principles relating to protective device coordination.
11. Identify the considerations and requirements for selecting protective devices and accessories.
12. Describe the procedures used to install and operate protective devices, their components and accessories.
13. Describe the procedures used to troubleshoot protective devices, their components and accessories.
14. Describe the procedures used to inspect protective devices, their components and accessories.

Learning Outcomes:

- Demonstrate knowledge of line capacitors, their characteristics and applications.
- Demonstrate knowledge of the procedures used to install, operate, protect, inspect and test line capacitors.
- Demonstrate knowledge of operating principles of line capacitors.

Objectives and Content:

1. Define terminology associated with line capacitors.
2. Identify hazards and describe safe work practices pertaining to line capacitors.
3. Interpret codes, standards and regulations pertaining to line capacitors.
4. Interpret information pertaining to line capacitors found on drawings and specifications.
5. Identify tools and equipment relating to line capacitors and describe their applications and procedures for use.
6. Identify types of line capacitors and describe their characteristics and applications.
 - i) shunt connection
 - ii) series connection
7. Identify line capacitor components and accessories and describe their characteristics and applications.
8. Describe the operating principles of line capacitors.
9. Identify the considerations and requirements for selecting line capacitors and accessories.
10. Describe the procedures used to install and operate line capacitors, their components and accessories.

11. Describe the procedures used to protect line capacitors, their components and accessories.
12. Describe the procedures used to inspect line capacitors, their components and accessories.
13. Describe the procedures used to test line capacitors, their components and accessories.

LEVEL 4

Learning Outcomes:

- Demonstrate knowledge of steel structure climbing, steel structure climbing equipment, its applications, limitations and procedures for use.

Objectives and Content:

1. Define terminology associated with steel structure climbing and equipment.
2. Identify hazards and describe safe work practices pertaining to steel structure climbing and equipment.
 - i) fall prevention and arrest
3. Describe the procedures used to perform rescues on steel structures.
4. Identify codes and regulations pertaining to steel structure climbing equipment.
 - i) training and certification requirements
5. Identify types of steel structure climbing equipment and describe their characteristics and applications.
6. Identify steel structure climbing equipment components and describe their characteristics and applications.
 - i) tower harnesses
 - ii) lanyards
7. Describe the procedures used to climb using climbing equipment.
8. Describe the procedures used to inspect, maintain and store climbing equipment and components.

PLT-405 Job Planning

Learning Outcomes:

- Demonstrate knowledge of the procedures used to plan and organize job tasks.

Objectives and Content:

1. Identify sources of information relevant to planning job tasks.
 - i) documentation
 - standard operating procedures (SOPs)
 - ii) drawings
 - iii) related professionals
 - iv) clients
2. Identify codes and regulations pertaining to job planning.
3. Describe the considerations to plan and organize job tasks.
 - i) permits
 - ii) risk assessments (tailboard)
 - iii) personnel
 - iv) tools and equipment
 - v) materials and supplies
 - vi) scheduling/sequencing
 - vii) environmental

PLT-410 Tree Trimming

Learning Outcomes:

- Demonstrate knowledge of tree trimming equipment, their applications, maintenance and procedures for use.
- Demonstrate knowledge of the techniques and procedures used to trim trees.

Objectives and Content:

1. Define terminology associated with tree trimming.
2. Identify hazards and describe safe work practices pertaining to tree trimming.
3. Interpret guidelines, codes and regulations pertaining to tree trimming.
4. Identify tools and equipment relating to tree trimming and describe their applications and procedures for use.
 - i) gas powered chain saws
 - ii) hand saws
 - iii) hydraulic saws
 - iv) mechanical pruning equipment
 - v) rigging
5. Identify the techniques used to trim trees.
6. Describe the procedures used to trim trees.

PLT-415 Transmission Systems

Learning Outcomes:

- Demonstrate knowledge of transmission systems, their applications and operation.
- Demonstrate knowledge of electrical transmission principles.
- Demonstrate knowledge of procedures used in the grounding and bonding of transmission systems.

Objectives and Content:

1. Define terminology associated with transmission systems.
2. Identify hazards and describe safe work practices pertaining to transmission systems.
3. Interpret codes, standards and regulations pertaining to transmission systems.
4. Interpret information pertaining to transmission systems found on drawings and specifications.
5. Identify tools and equipment relating to transmission systems and describe their applications and procedures for use.
6. Identify types of transmission systems and describe their characteristics and applications.
7. Explain the principles of electrical transmission.
8. Identify transmission system components and describe their applications and operation.
9. Describe the procedures used to install transmission systems.
 - i) tension stringing
10. Identify grounding and bonding requirements relating to transmission systems.
11. Describe the procedures used for temporary grounding and bonding of transmission systems.
12. Explain troubleshooting and repair procedures related to transmission systems.

PLT-420 Transmission Structures

Learning Outcomes:

- Demonstrate knowledge of transmission structures, their components and applications.
- Demonstrate knowledge of the procedures used to inspect and maintain transmission structures.

Objectives and Content:

1. Define terminology associated with transmission structures.
2. Identify hazards and describe safe work practices pertaining to transmission structures.
3. Interpret codes, standards and regulations pertaining to transmission structures.
4. Interpret information pertaining to transmission structures found on drawings and specifications.
5. Identify tools and equipment relating to transmission structures and describe their applications and procedures for use.
6. Identify types of transmission structures and describe their characteristics and applications.
 - i) single pole
 - ii) "H" – Frame
 - iii) "H" – Frame with overhead ground wire
 - iv) steel tower
7. Identify transmission structure components and accessories and describe their applications and operation.
8. Describe the procedures used to inspect and maintain transmission structures, their components and accessories.

Learning Outcomes:

- Demonstrate knowledge of substations, switching stations and terminals, their characteristics and applications.
- Demonstrate knowledge of the procedures used to inspect and maintain substations, switching stations and terminals.

Objectives and Content:

1. Define terminology associated with substations, switching stations and terminals.
2. Identify hazards and describe safe work practices pertaining to substations, switching stations and terminals.
3. Interpret codes, standards and regulations pertaining to substations, switching stations and terminals.
4. Interpret information pertaining to substations, switching stations and terminals found on drawings and specifications.
5. Identify tools and equipment relating to substations, switching stations and terminals and describe their applications and procedures for use.
6. Identify types of substations, switching stations and terminals and describe their characteristics and applications.
7. Identify substation, switching station and terminal components and accessories and describe their operation.
8. Describe the procedures used to inspect and maintain substations, their components and accessories.
9. Describe the procedures used to inspect and maintain switching stations, their components and accessories.
10. Describe the procedures used to inspect and maintain terminals, their components and accessories.

APPENDIX

Recommended Level Structure (3-Year Apprenticeship)

During the development workshop for the Powerline Technician IPG, the subject matter experts completed the leveling exercise to develop the Recommended Level Structure for the IPG. This was completed based on a 4-year training program.

In addition to this recommended 4-year structure, the group developed a suggested 3-year structure to assist jurisdictions with a 3-year training program. This 3-year structure has been included in the IPG as a reference only.

LEVEL 1					
Unit Code	Title	Page	Unit Code	Title	Page
PLT-100	Safety	18	PLT-150	DC Theory	33
PLT-105	Tools and Equipment	20	PLT-155	DC Circuits	35
PLT-110	Access Equipment	21	PLT-160	AC Theory	36
PLT-115	Pole Climbing	22	PLT-165	Grounding and Bonding	37
PLT-120	Rigging, Hoisting and Lifting	23	PLT-170	Conductors and Cables	38
PLT-125	Aerial Devices and Hydraulics	25	PLT-175	Sagging Conductors	40
PLT-130	On- and Off- Road Equipment	27	PLT-180	Single-Phase Circuits	41
PLT-135	Introduction to Communication and Trade Documentation	29	PLT-185	Overhead Distribution Structures	42
PLT-140	Traffic Control	31	PLT-245	Single-Phase Metering	59
PLT-145	Power and Energy	32			
LEVEL 2					
Unit Code	Title	Page	Unit Code	Title	Page
PLT-200	Drawings, Schematics and Specifications	46	PLT-230	Overhead Distribution Systems	54
PLT-205	AC Circuits	47	PLT-235	Underground Distribution Systems	56
PLT-210	Series and Parallel Circuits	48	PLT-240	Live Line Work	58
PLT-215	Inductance and Capacitance	49	PLT-325	Line Protective Devices	71
PLT-220	Transformers	50	PLT-250	Street Lighting Systems	60
PLT-225	Distribution Lines	52			
LEVEL 3					
Unit Code	Title	Page	Unit Code	Title	Page
PLT-400	Steel Structure Climbing	76	PLT-310	Three-Phase Circuits	67
PLT-405	Job Planning	77	PLT-420	Transmission Structures	80
PLT-410	Tree Trimming	78	PLT-315	Three-Phase Metering	68
PLT-300	Transformer Banking	64	PLT-320	Voltage Regulation and Control Devices	69
PLT-305	Power Transformers	66	PLT-330	Line Capacitors	73
PLT-415	Transmission Systems	79	PLT-425	Substations, Switching Stations and Terminals	81