Atlantic Workforce Partnership

Curriculum Standard

POWERLINE TECHNICIAN

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Atlantic Apprenticeship

COUNCIL OF ATLANTIC PREMIERS
CONSEIL DES PREMIERS MINISTRES DE L'ATLANTIQUE

Employment and Social Development Canada
Emploi et Développement social Canada

PLAN OF TRAINING

Atlantic Apprenticeship Curriculum Standard

PowerLine Technician

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Newfoundland Labrador

Government of Newfoundland and Labrador
Department of Immigration, Population Growth and Skills
Apprenticeship and Trades Certification Division

Approved by:

Leonard Harnum

Chairperson, Provincial Apprenticeship and Certification Board

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Atlantic Apprenticeship Curriculum Standard

Powerline Technician

Preface

This Atlantic Apprenticeship Curriculum Standard is intended to assist instructional staff in the design and delivery of technical, in-class training in support of the Powerline Technican program.

This document contains all the technical training elements required to complete the Powerline Technican apprenticeship program and has been developed based on the Red Seal Occupational Standard (RSOS). The RSOS can be found on the Red Seal website (www.red-seal.ca).

Implementation of this AACS for Apprenticeship training is outlined in the following table.

Level	Implementation Effective
Level 1	2023-2024
Level 2	2024-2025
Level 3	2025-2026
Level 4	2026-2027

******* **The above implementation schedule was current at time of printing. Please confirm with Apprenticeship Staff prior to commencing training.**

Granting of credit or permission to challenge level examinations for pre-employment or pre-apprenticeship training for the Powerline Technican trade will be based on the content outlined in this standard. Training providers must contact their provincial apprenticeship authority for more information on the process and requirements for determining eligibility for credit towards an apprenticeship program. Programs which have been deemed acceptable by the jurisdictional apprenticeship authority will be identified in a transfer credit matrix developed through the Atlantic Apprenticeship Harmonization Project.

Acknowledgements

The development of the Atlantic Apprenticeship Curriculum Standard (AACS) is an initiative of the Atlantic Apprenticeship Council's Atlantic Apprenticeship Harmonization Project (AAHP) through the Atlantic Workforce Partnership and Employment and Social Development Canada.

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User Guide

Atlantic Apprenticeship Curriculum Standards (AACS) are developed based on Red Seal Occupational Standards (RSOS), National Occupational Analyses (NOA), Interprovincial Program Guides (IPG), if available, and extensive industry consultation. This document represents the minimum content to be delivered as part of the harmonized Atlantic program for the Powerline Technician trade.

The AACSs are deliberately constructed for ease of use and flexibility of structure in order to adapt to all delivery requirements. They detail units of training, unit outcomes and objectives. They do 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 AACS does not dictate study materials, textbooks or learning activities to be used in delivery.

The document includes a Level Structure to facilitate mobility for apprentices moving from one jurisdiction to another.

Structure

The content of the AACS is divided into units. Unit codes are used as a means of identification and are not intended to convey the order of delivery. It is at the discretion of the training provider to deliver the content in the required logical sequence of delivery within the level. Jurisdictions are free to deliver units one at a time or concurrently within a level, provided all outcomes are met.

The Learning Outcomes describe what the apprentice should know or be able to do at the end of training. Wording of the Learning Outcomes, “Demonstrate knowledge of…” acknowledges the broad spectrum of ways in which knowledge can be assessed (ie. practical projects, multiple choice testing, presentations, etc.) by instructional staff within the training.

Summative evaluation will be through a multiple-choice Level Examination administered through the jurisdictional Apprenticeship Authority.

The 2019 Red Seal Occupational Standard (RSOS) to AACS Comparison chart outlines the relation between each RSOS sub-task and the AACS units. RSOS References have also been detailed in each unit to highlight the direct link between the unit and relevant sub-tasks in the RSOS.

In the Level Structure section, the document identifies suggested hours in order to provide an indication of the time it should take to cover the material in the unit and is provided as a guide only. Adjustments to the suggested hours for each unit may be required to account for rate of apprentice learning, statutory holidays, storm days, registration and examinations. These suggested hours detailed for each unit will represent both theory and practical training (if relevant) and for consistency will be based on a standard of 30 hours per week of training. The true length of time required to deliver an outcome successfully will depend upon the learning activities and teaching methods used.

There are two types of objectives found in the AACS document: theoretical and practical.

The theoretical objectives represent the material that is to be covered during the technical training in order to convey the required knowledge to the apprentice.

The practical objectives represent the tasks or skills that have been deemed by the Atlantic Trade Advisory Committee as critical for the apprentices to receive exposure to while attending technical training. For example, exposure could be done through instructor demonstration or individual or group performance of the skill or task. Training providers are encouraged to use practical demonstration and opportunities for hands-on learning whenever possible. Practical objectives are not intended to replace the on-the-job training component of the apprentice's program or to mirror or replace the logbook skills that are to be taught and evaluated in the workplace.

Detailed content for each objective has not been developed. Where detail is required for clarity, content has been provided.

Glossary of Terms

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

Adjust	To put in good working order; regulate; bring to a proper state or position.
Application	The use to which something is put and/or the circumstance in which an individual 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.

Glossary of Terms (continued)

Service	Routine inspection and replacement of worn or deteriorating parts. An act or business function provided to a customer in the course of an individual's profession (e.g., haircut).
Technique	Within a procedure, the manner in which technical skills are applied.
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.

Essential Skills / Skills for Success

Through extensive research, the Government of Canada and other national and international agencies have identified and validated key essential skills for the workplace. These skills are used in nearly every job and at different levels of complexity. They provide the foundation for learning all other skills and enable people to evolve with their jobs and adapt to workplace change. In response to the evolving labour market and changing skill needs, in 2021 the Government of Canada launched a new **Skills for Success** model (QR code #1 or the web link below).
https://www.canada.ca/en/services/jobs/training/initiatives/skills-success/new-model.html

The Employment and Social Development Canada (ESDC) website provides information about the Skills for Success, including:

- a brief description of the skill;
- why the skill is important;
- tools to help you improve on each of the skills, and
- videos to help you improve on each of the skills.

This information can be found at: QR code #2 or the web link below.
https://www.jobbank.gc.ca/essentialskills

Skills for Success training tools can be found at: QR code #3 or the web link below.
https://www.canada.ca/en/services/jobs/training/initiatives/skills-success/tools.html

The development and improvement of these Skills for Success is inherent throughout the apprenticeship training program as apprentices work towards achieving journeyperson status.

#1 The new Skills for Success model – Canada.ca

#2 Explore careers by essential skills – Job Bank

#3 Assessment and training tools – Canada.ca

Level Structure

Level 1 – 5 Weeks

Unit Code	Unit Title	Suggested Hours	Page Number
PLT-100	Safety	6	20
PLT-105	Bonding and Grounding	6	22
PLT-110	Tools and Equipment	9	24
PLT-115	Work Planning	3	27
PLT-120	Work Area Access	3	29
PLT-125	DC Electricity	30	32
PLT-130	Single-Phase AC Theory	27	35
PLT-135	Single-Phase AC Circuits I	18	37
PLT-140	Introduction to Live-Line Methods	6	39
PLT-145	Communication Techniques	3	41
PLT-150	Pole Structures	9	43
PLT-155	Steel Lattice Structures I	6	47
PLT-160	Introduction to Single-Phase Transformers	6	49
PLT-165	Communication Lines	3	51
PLT-170	Non-Tension Stringing	6	52
PLT-175	Sag Conductors	3	54
PLT-180	Overhead Conductors and Cable Tie-Ins	3	56
PLT-185	Splices and Connections	3	58

Level Structure (continued)

Level 2 – 8 Weeks

Unit Code	Unit Title	Suggested Hours	Page Number
PLT-200	Single-Phase AC Circuits II	30	61
PTN-205	Live-Lines I	51	63
PTN-210	Tension Stringing	12	65
PLT-215	Underground and Underwater Cable	33	67
PTN-220	Lighting Systems	15	71
PTN-225	Single-Phase Transformers	18	73
PTN-230	Single-Phase Switches	12	75
PLT-235	Protection Equipment I	9	77
PTN-240	Secondary Metering Equipment	12	79
PLT-245	Introduction to Distribution Systems	6	81
PLT-250	Distribution and Transmission Systems Maintenance I	6	83
PTN-255	Overhead Distribution Systems Repair I	12	86
PTN-260	Underground and Underwater Distribution Systems Repair I	15	88
PLT-265	Overhead Transmission Systems Repair I	6	91
PLT-270	Underground and Underwater Transmission Systems Repair I	3	93

Level 3 – 7 Weeks

Unit Code	Unit Title	Suggested Hours	Page Number
PLT-300	Three-Phase AC Theory	12	96
PTN-305	Live-Lines II	30	98
PLT-310	Distribution Tension Method	12	100
PTN-315	Three-Phase Transformers	55	102
PTN-320	Voltage Control Equipment I	15	105
PTN-325	Protection Equipment II	15	108
PLT-330	Primary Metering	15	111
PLT-335	Introduction to Transmission Systems	6	113
PLT-340	Distribution and Transmission Systems Maintenance II	6	115
PLT-345	Overhead Distribution Systems Troubleshooting	9	118
PLT-350	Underground and Underwater Distribution Systems Troubleshooting	6	120
PLT-355	Overhead Distribution Systems Repair II	12	123
PTN-360	Underground and Underwater Distribution Systems Repair II	17	125

Level Structure (continued)

Level 4 – 8 Weeks

Unit Code	Unit Title	Suggested Hours	Page Number
PLT-400	Mentoring	6	129
PLT-405	Live-Lines III	3	131
PLT-410	Transmission Tension Method	6	133
PLT-415	Power Transformers	12	135
PTN-420	Voltage Control Equipment II	23	137
PLT-425	Cellular Antennas	3	140
PTN-430	Station Switching	60	141
PTN-435	Distribution and Transmission Systems Maintenance III	30	144
PTN-440	Steel Lattice Structures II	9	147
PLT-445	Overhead Transmission Systems Troubleshooting	6	149
PTN-450	Underground and Underwater Transmission Systems Troubleshooting	16	151
PTN-455	Overhead Transmission Systems Repair II	18	153
PTN-460	Underground and Underwater Transmission Systems Repair II	18	155
PLT-465	Program Review	30	157

2019 RSOS Sub-Task to AACS Unit Comparison

2019 RSOS Task Sub-task		AACS Unit	
Task A-1 – Performs safety-related functions.			
A-1.01	Uses personal protective equipment (PPE) and safety equipment	PLT-100	Safety
A-1.02	Controls powerline hazards	PLT-100	Safety
		PLT-140	Introduction to Live-Line Methods
A-1.03	Controls environmental hazards	PLT-100	Safety
A-1.04	Performs lock-out and tag-out procedures	PLT-100	Safety
A-1.05	Performs temporary grounding and bonding procedures	PLT-105	Bonding and Grounding
Task A-2 – Uses and maintains tools and equipment.			
A-2.01	Uses hand, power and powder-actuated tools and equipment	PLT-110	Tools and Equipment
A-2.02	Uses electrical measuring and testing equipment	PLT-110	Tools and Equipment
A-2.03	Uses rigging, hoisting and lifting equipment	PLT-110	Tools and Equipment
Task A-3 – Organizes work.			
A-3.01	Interprets plans, drawings and specifications	PLT-115	Work Planning
A-3.02	Prepares worksite	PLT-115	Work Planning
A-3.03	Plans job task and procedures	PLT-115	Work Planning
Task A-4 – Accesses work area.			
A-4.01	Climbs pole and steel lattice structures	PLT-120	Work Area Access
A-4.02	Uses access equipment	PLT-120	Work Area Access
A-4.03	Uses on- and off-road equipment	PLT-120	Work Area Access
Task A-5 – Uses live-line methods.			
A-5.01	Uses cover-up	PLT-140	Introduction to Live-Line Methods
		PTN-210	Tension Stringing
		PLT-310	Distribution Tension Method
A-5.02	Uses rubber gloves	PTN-205	Live-Lines I
		PLT-245	Introduction to Distribution Systems
		PLT-250	Distribution and Transmission Systems Maintenance I
		PTN-255	Overhead Distribution Systems Repair I

2019 RSOS Task Sub-task		AACS Unit	
		PLT-265	Overhead Transmission Systems Repair I
A-5.03	Uses bare-hand methods (Not Common Core)	PLT-405	Live-Lines III
A-5.04	Uses fibreglass reinforced plastic (FRP) tools (hot sticks)	PLT-235	Protection Equipment I
		PLT-245	Introduction to Distribution Systems
		PTN-305	Live-Lines II
		PTN-320	Voltage Control Equipment I
		PTN-325	Protection Equipment II
		PLT-330	Primary Metering
		PLT-335	Introduction to Transmission Systems
		PTN-420	Voltage Control Equipment II
Task A-6- Uses communication and mentoring techniques.			
A-6.01	Uses communication techniques	PLT-145	Communication Techniques
A-6.02	Uses mentoring techniques	PLT-400	Mentoring
Task B-7 – Installs pole structures.			
B-7.01	Frames pole structures	PLT-150	Pole Structures
		PLT-245	Introduction to Distribution Systems
B-7.02	Sets pole structures	PLT-150	Pole Structures
B-7.03	Installs pole structure guys and anchors	PLT-150	Pole Structures
Task 8 – Installs steel lattice structures.			
B-8.01	Assembles steel lattice structures	PLT-155	Steel Lattice Structures I
B-8.02	Erects steel lattice structures	PLT-155	Steel Lattice Structures I
B-8.03	Installs steel lattice structure guy wires and anchors	PLT-155	Steel Lattice Structures I
Task C-9 – Installs overhead conductors and cables.			
C-9.01	Strings overhead conductors and cables	PLT-130	Single-Phase AC Theory
		PLT-135	Single-Phase AC Circuit I
		PLT-170	Non Tension Stringing
		PLT-200	Single-Phase AC Circuit II
		PTN-210	Tension Stringing
		PLT-310	Distribution Tension Method
		PLT-410	Transmission Tension Method
C-9.02	Sags overhead conductors and cables	PLT-175	Sag Conductors
		PTN-210	Tension Stringing
		PLT-310	Distribution Tension Method
		PLT-410	Transmission Tension Method
C-9.03	Ties-in overhead conductors and cables	PLT-180	Overhead Conductors and Cable Tie-Ins

2019 RSOS Task Sub-task		AACS Unit	
		PTN-210	Tension Stringing
		PLT-310	Distribution Tension Method
		PLT-410	Transmission Tension Method
C-9.04	Installs splices and connections to overhead conductors and cables	PLT-185	Splices and Connections
		PTN-210	Tension Stringing
		PLT-310	Distribution Tension Method
		PLT-410	Transmission Tension Method
Task C-10 – Installs underground and underwater cable.			
C-10.01	Installs conduit and cable	PLT-215	Underground and Underwater Cable
C-10.02	Places direct buried cable	PLT-215	Underground and Underwater Cable
C-10.03	Splices underground and underwater cable	PLT-215	Underground and Underwater Cable
C-10.04	Terminates underground and underwater cable	PLT-215	Underground and Underwater Cable
Task D-11 – Installs lighting systems.			
D-11.01	Installs street lights	PTN-220	Lighting Systems
D-11.02	Maintains street lights	PTN-220	Lighting Systems
Task D-12 – Installs voltage control equipment.			
D-12.01	Installs transformers	PLT-115	Work Planning
		PLT-160	Introduction to Single-Phase Transformers
		PTN-225	Single-Phase Transformers
		PLT-245	Introduction to Distribution Systems
		PLT-250	Distribution and Transmission Systems Maintenance I
		PLT-300	Three-Phase AC Theory
		PTN-315	Three-Phase transformers
		PLT-415	Power Transformers
D-12.02	Installs capacitors	PLT-115	Organizes Work
		PLT-245	Introduction to Distribution Systems
		PTN-420	Voltage Control Equipment II
D-12.03	Installs voltage regulators	PLT-115	Work Planning
		PLT-245	Introduction to Distribution Systems
		PTN-320	Voltage Control Equipment I
		PTN-420	Voltage Control Equipment II
D-12.04	Installs switches.	PLT-115	Work Planning
		PLT-160	Introduction to Single-Phase Transformers

2019 RSOS Task Sub-task		AACS Unit	
		PTN-225	Single-Phase Transformers
		PTN-230	Single-Phase Switches
		PLT-245	Introduction to Distribution Systems
		PLT-250	Distribution and Transmission Systems Maintenance I
		PTN-320	Voltage Control Equipment I
D-12.05	Installs reactors (Not Common Core)	PTN-420	Voltage Control Equipment II
Task D-13 – Installs protection equipment.			
D-13.01	Installs reclosers	PLT-245	Introduction to Distribution Systems
		PTN-325	Protection Equipment II
D-13.02	Installs sectionalizers	PLT-245	Introduction to Distribution Systems
		PTN-325	Protection Equipment II
D-13.03	Installs fuses	PLT-235	Protection Equipment I
		PTN-325	Protection Equipment II
D-13.04	Installs lightning arrestors	PLT-235	Protection Equipment I
Task D-14 – Installs metering equipment.			
D-14.01	Installs primary metering equipment	PLT-330	Primary Metering
D-14.02	Installs secondary metering equipment	PTN-240	Secondary Metering Equipment
Task D-15 – Installs communication devices.			
D-15.01	Installs cellular antennas	PLT-425	Cellular Antennas
D-15.02	Transfers communication lines	PLT-165	Communication Lines
Task E-16 – Operates distribution and transmission systems.			
E-16.01	Operates transmission systems	PLT-130	Single-Phase AC Theory
		PLT-135	Single-Phase AC Circuits I
		PLT-200	Single-Phase AC Circuits II
		PLT-335	Introduction to Transmission Systems
		PTN-430	Station Switching
E-16.02	Operates distribution systems	PLT-130	Single-Phase AC Theory
		PLT-135	Single-Phase AC Circuits I
		PLT-200	Single-Phase AC Circuits II
		PLT-245	Introduction to Distribution Systems
		PTN-430	Station Switching
E-16.03	Performs station switching	PLT-130	Single-Phase AC Theory
		PLT-135	Single-Phase AC Circuits I
		PLT-200	Single-Phase AC Circuits II
		PTN-430	Station Switching

2019 RSOS Task Sub-task		AACS Unit	
Task E-17 – Maintains distribution and transmission systems.			
E-17.01	Inspects distribution and transmission systems	PLT-130	Single-Phase AC Theory
		PLT-135	Single-Phase AC Circuits I
		PLT-200	Single-Phase AC Circuits II
		PLT-340	Distribution and Transmission Systems Maintenance II
		PTN-435	Distribution and Transmission Systems Maintenance III
E-17.02	Maintains pole structures	PLT-130	Single-Phase AC Theory
		PLT-135	Single-Phase AC Circuits I
		PLT-200	Single-Phase AC Circuits II
		PLT-250	Distribution and Transmission Systems Maintenance I
		PLT-340	Distribution and Transmission Systems Maintenance II
E-17.03	Maintains steel lattice structures	PLT-130	Single-Phase AC Theory
		PLT-135	Single-Phase AC Circuits I
		PLT-200	Single-Phase AC Circuits II
		PTN-440	Steel Lattice Structures II
E-17.04	Maintains system components	PLT-130	Single-Phase AC Theory
		PLT-135	Single-Phase AC Circuits I
		PLT-200	Single-Phase AC Circuits II
		PLT-250	Distribution and Transmission Systems Maintenance I
		PLT-340	Distribution and Transmission Systems Maintenance II
		PTN-435	Distribution and Transmission Systems Maintenance III
E-17.05	Trims trees	PLT-250	Distribution and Transmission System Maintenance I
Task E-18 – Repairs distribution systems.			
E-18.01	Troubleshoots overhead distribution systems	PLT-130	Single-Phase AC Theory
		PLT-135	Single-Phase AC Circuits I
		PLT-200	Single-Phase AC Circuits II
		PLT-345	Overhead Distribution Systems Troubleshooting
E-18.02	Troubleshoots underground and underwater distribution systems	PLT-130	Single-Phase AC Theory
		PLT-135	Single-Phase AC Circuits I
		PLT-200	Single-Phase AC Circuits II
		PLT-350	Underground and Underwater Distribution Systems Troubleshooting
E-18.03		PLT-130	Single-Phase AC Theory

2019 RSOS Task Sub-task		AACS Unit	
	Repairs overhead distribution systems	PLT-135	Single-Phase AC Circuits I
		PLT-200	Single-Phase AC Circuits II
		PTN-255	Overhead Distribution Systems Repair I
		PLT-355	Overhead Distribution Systems Repair II
E-18.04	Repairs underground and underwater distribution systems	PLT-130	Single-Phase AC Theory
		PLT-135	Single-Phase AC Circuits I
		PLT-200	Single-Phase AC Circuits II
		PTN-260	Underground and Underwater Distribution Systems Repair I
		PTN-360	Underground and Underwater Distribution Systems Repair II
Task E-19 – Repairs transmission systems.			
E-19.01	Troubleshoots overhead transmission systems	PLT-130	Single-Phase AC Theory
		PLT-135	Single-Phase AC Circuits I
		PLT-200	Single-Phase AC Circuits II
		PLT-445	Overhead Transmission Systems Troubleshooting
E-19.02	Troubleshoots underground and underwater transmission systems	PLT-130	Single-Phase AC Theory
		PLT-135	Single-Phase AC Circuits I
		PLT-200	Single-Phase AC Circuits II
		PTN-450	Underground and Underwater Transmission Systems Troubleshooting
E-19.03	Repairs overhead transmission systems	PLT-130	Single-Phase AC Theory
		PLT-135	Single-Phase AC Circuits I
		PLT-200	Single-Phase AC Circuits II
		PLT-265	Overhead Transmission Systems Repair I
		PTN-455	Overhead Transmission Systems Repair II
E-19.04	Repairs underground and underwater transmission systems	PLT-130	Single-Phase AC Theory
		PLT-135	Single-Phase AC Circuits I
		PLT-200	Single-Phase AC Circuits II
		PLT-270	Underground and Underwater Transmission Systems Repair I
		PTN-460	Underground and Underwater Transmission Systems Repair II

Level 1

Unit Code	Unit Title	Hours	Page
PLT-100	Safety	6	20
PLT-105	Bonding and Grounding	6	22
PLT-110	Tools and Equipment	9	24
PLT-115	Work Planning	3	27
PLT-120	Work Area Access	3	29
PLT-125	DC Electricity	30	32
PLT-130	Single-Phase AC Theory	27	35
PLT-135	Single-Phase AC Circuits I	18	37
PLT-140	Introduction to Live-Line Methods	6	39
PLT-145	Communication Techniques	3	41
PLT-150	Pole Structures	9	43
PLT-155	Steel Lattice Structures I	6	47
PLT-160	Introduction to Single-Phase Transformers	6	49
PLT-165	Communication Lines	3	51
PLT-170	Non-Tension Stringing	6	52
PLT-175	Sag Conductors	3	54
PLT-180	Overhead Conductors and Cable Tie-Ins	3	56
PLT-185	Splices and Connections	3	58

PLT-100 Safety

Learning Outcomes:

- Demonstrate knowledge of safety equipment and personal protective equipment (PPE), their applications, maintenance and procedures for use.
- Demonstrate knowledge of safe work practices.
- Demonstrate knowledge of regulatory requirements pertaining to safety and environmental hazards.
- Demonstrate knowledge of lock-out and tag-out procedures and legislation.
- Demonstrate knowledge of safety checks of equipment.
- Demonstrate knowledge of the procedures used for checking for potential.

2019 Red Seal Occupational Standard Reference:

1.01 Uses personal protective equipment (PPE) and safety equipment.
1.02 Controls powerline hazards.
1.03 Controls environmental hazards.
1.04 Performs lock-out and tag-out procedures.

Suggested Hours

6 Hours

Theoretical Objectives:

1. Identify hazards and describe safe work practices.
    i) powerline hazards
        - personal
            - fall protection
        - overhead
            - foreign debris
            - broken poles
            - insulators
            - tie wires
            - crossarms
        - underground and underwater
            - gases
            - fumes
            - flooding
            - cave-ins
    ii) environmental hazards
        - oil spills
        - gas spills
        - fire conditions

- working in the vicinity of environmentally sensitive areas
- protected wildlife

2. Interpret codes, standards and regulations pertaining to environmental hazards.

3. Identify types of safety equipment and personal protective equipment (PPE), and describe their applications and limitations.
   i) safety equipment
      - fire extinguishers
      - first aid kits
      - rescue equipment
      - automated external defibrillator (AED)
      - burn kit
   ii) PPE
      - hard hats
      - rubber gloves
      - safety boots
      - safety glasses
      - face shields
      - hearing protection
      - flame retardant clothing (FRC)
      - arc flash clothing

4. Identify and describe workplace safety and health regulations.

5. Describe the procedures used to inspect and maintain safety equipment and personal protective equipment (PPE).

6. Describe lock-out and tag-out procedures and legislation governing minimum standards.
   i) work permit
   ii) hold off
   iii) conditional permit

7. Describe safety checks to be performed.

8. Describe the procedures used for checking for potential.

Practical Objectives:

N/A

PLT-105 Bonding and Grounding

Learning Outcomes:

- Demonstrate knowledge of the principles of temporary grounding and bonding procedures.
- Demonstrate knowledge of the procedures used to perform temporary grounding and bonding.

2019 Red Seal Occupational Standard Reference:

1.05 Performs temporary grounding and bonding procedures.

Suggested Hours:

6 Hours

Theoretical Objectives:

1. Define terminology associated with temporary grounding and bonding procedures.

2. Identify hazards and describe safe work practices pertaining to temporary grounding and bonding procedures.

3. Interpret jurisdictional codes, rules and regulations pertaining to temporary grounding and bonding procedures.

4. Interpret information pertaining to temporary grounding and bonding procedures found on drawings and specifications.

5. Identify tools and equipment used for temporary grounding and bonding procedures and describe their applications and procedures for use.
   i) temporary grounds
   ii) pole band
   iii) temporary ground rod
   iv) potential indicator
   v) FRP tools (hot sticks)
   vi) wire brush

6. Identify equi-potential grounding and bonding procedures and describe their applications.

7. Identify line protection requirements related to temporary grounding and bonding procedures.

8. Describe principles of temporary grounding and bonding procedures.

9. Describe the procedures used to perform temporary grounding and bonding.

10. Interpret information and perform calculations pertaining to temporary grounding and bonding procedures.
    i) fault current levels
    ii) current leakage test

Practical Objectives:

N/A

PLT-110 Tools and Equipment

Learning Outcomes:

- Demonstrate knowledge of tools and equipment, their applications, and procedures for use.
- Demonstrate knowledge of the procedures used to inspect and maintain tools and equipment.
- Demonstrate knowledge of electrical measuring and testing equipment, their components, applications, maintenance and procedures for use.
- Demonstrate knowledge of the procedures to use electrical measuring and testing equipment, and their components.
- Demonstrate knowledge of rigging, hoisting and lifting equipment, their applications, limitations and procedures for use.
- Demonstrate knowledge of rigging, hoisting and lifting techniques.

2019 Red Seal Occupational Standard Reference:

2.01 Uses hand, power and powder-actuated tools and equipment.
2.02 Uses electrical measuring and testing equipment.
2.03 Uses rigging, hoisting and lifting equipment.

Suggested Hours

9 Hours

Theoretical Objectives:

1. Define terminology associated with rigging, hoisting and lifting equipment.

2. Identify hazards and describe safe work practices pertaining to rigging, hoisting and lifting equipment.

3. Identify codes and regulations related to rigging, hoisting and lifting equipment.

4. Interpret information related to rigging, hoisting and lifting equipment found on drawings and specifications.

5. Identify types of tools, equipment and their components and describe their applications and procedures for use.
   i) hand tools
   ii) power tools
   iii) powder-actuated tools
   iv) rigging equipment
      - slings

- wire/conductor grips
- shackles
- ropes
- cables

v) hoisting and lifting equipment
- chain hoists
- rope blocks
- cable winches
- capstan hoists
- web hoists
- levers

vi) electrical measuring and test equipment
- voltmeter
- phasing sticks
- rotation meter
- ammeter
- megger
- batteries
- leads

6. Identify types of knots, hitches, splices and bends and describe their applications and the procedures for use.

7. Describe the procedures used to inspect and maintain tools, equipment and their components.

i) tools
- hand
- power
- powder-actuated

ii) equipment
- electrical measuring and test equipment
- rigging, hoisting and lifting equipment

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

9. Describe the considerations and factors when rigging, hoisting and lifting equipment or material.

i) considerations
- load characteristics
- load charts
- equipment and accessories
- anchor points
- sling angles
- hand signals

ii) factors

- weight of load
- safety factors
- controlling the load
- securing the load
- travel path
- weather conditions
- conductor weights and tensions

10. Perform calculations pertaining to rigging, hoisting, and lifting.

Practical Objectives:

1. Tie various knots, splices and hitches used in rigging and lifting.

PLT-115 Work Planning

Learning Outcomes:

- Demonstrate knowledge of drawings, schematics and specifications and their applications.
- Demonstrate knowledge of interpreting and extracting information from drawings, schematics and specifications.
- Demonstrate knowledge of safe work practices.
- Demonstrate knowledge of regulatory requirements pertaining to safety.
- Demonstrate knowledge of the procedures used to prepare the worksite.
- Demonstrate knowledge of the procedures used to plan and organize job tasks.

2019 Red Seal Occupational Standard Reference:

3.01 Interprets plans, drawings and specifications.
3.02 Prepares worksite.
3.03 Plans job tasks and procedures.
12.01 Installs transformers.
12.02 Installs capacitors.
12.03 Installs voltage regulators.
12.04 Installs switches.

Suggested Hours:

3 Hours

Theoretical Objectives:

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, schematics and specifications.
   i) symbols
   ii) abbreviations

4. Identify obstacles and hazards and describe safe work practices.
   i) snow
   ii) ice
   iii) trees
   iv) boulders
   v) traffic

vi) public
vii) workplace
- biohazards
viii) fire
ix) heights
x) chemicals
xi) gas
xii) radiation
xiii) asbestos
xiv) environmental
- discharge/spills

5. Identify and describe workplace safety and health regulations.
i) federal
- Safety Data Sheets (SDS)
ii) WHMIS
iii) Transportation of Dangerous Goods (TDG)
iv) provincial/territorial
- Occupational Health and Safety (OH&S)
v) municipal

6. Identify sources of information relevant to preparing work sites and planning job tasks.
i) SOPs
ii) drawings
iii) related professionals
iv) clients

7. Identify codes and regulations pertaining to job planning.

8. Describe the considerations to follow a job 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
viii) traffic
ix) public safety
x) communication methods

Practical Objectives:

N/A

PLT-120 Work Area Access

Learning Outcomes:

- Demonstrate knowledge of pole structure climbing, pole climbing equipment, and their applications, limitations and procedures for use.
- Demonstrate knowledge of the procedures used to climb pole structures and inspect and maintain pole climbing equipment.
- Demonstrate knowledge of steel lattice structure climbing, steel lattice structure climbing equipment, its applications, limitations and procedures for use.
- Demonstrate knowledge the procedures used to climb steel lattice structures and inspect and maintain steel lattice structure climbing equipment.
- Demonstrate knowledge of access equipment, their characteristics, applications and limitations.
- Demonstrate knowledge of the procedures used to erect, remove, inspect, maintain, transport and store access equipment, their characteristics, applications and limitations.
- Demonstrate knowledge of on- and off-road equipment and their characteristics and applications.
- Demonstrate knowledge of the procedures used to operate, inspect and maintain on- and off-road equipment.

2019 Red Seal Occupational Standard Reference:

4.01 Climbs pole and steel lattice structures.
4.02 Uses access equipment.
4.03 Uses on- and off-road equipment.

Suggested Hours:

3 Hours

Theoretical Objectives:

1. Define terminology associated with work access equipment.
   i) climbing equipment
   ii) access equipment
   iii) on/off road equipment

2. Identify hazards and describe safe work practices related to work access equipment.
   i) falling
   ii) electrocution
   iii) uneven terrain
   iv) vehicle roll-over
   v) water
   vi) ice

vii) wildlife

3. Identify codes and regulations related to work access equipment.
   i) training
   ii) certification requirements
   iii) licensing requirements
   iv) environmental regulations
   v) jurisdictional regulations

4. Interpret information pertaining to on- and off-road equipment found in manufacturers' specifications.

5. Identify types of work access equipment and describe their characteristics, applications and limitations.
   i) pole climbing equipment
      - belts
      - spurs
      - fall restrict equipment
   ii) steel lattice structure climbing equipment
      - tower harnesses
      - lanyards
      - life line/fall line
      - shepherd's hook
   iii) access equipment
      - fibreglass ladders
      - aerial work platforms
        - aerial boom/scissor lift
        - bucket trucks
        - crane with work platform
        - insulated aerial device
        - insulated pole platforms (diving board)
        - material handling aerial device (MHAD)
        - radial boom derricks (RBD) with bucket attachment
   iv) on/off road equipment
      - bucket trucks
      - radial boom derricks (RBD)
      - off-road track machines
      - hydro-vacuum excavators
      - quads
      - side-by-sides
      - boats
      - snowmobiles

6. Identify on- and off-road equipment components and accessories and describe their characteristics and applications.
    i) mechanical
    ii) hydraulic

7. Describe the procedures related to work area access.
    i) climb using pole and steel lattice structure climbing equipment
    ii) inspect, maintain and store pole climbing and steel lattice structure equipment according to manufacturers' specifications
    iii) perform rescue on pole tops and steel lattice structures
    iv) erect and remove access equipment
    v) inspect and maintain access equipment
    vi) transport access equipment
    vii) operate on- and off-road equipment
    viii) inspect and maintain on- and off-road equipment

Practical Objectives:

N/A

PLT-125 DC Electricity

Learning Outcomes:

- Demonstrate knowledge of direct current (DC) electricity, its hazards, characteristics, and associated principles.
- Demonstrate knowledge of basic electric circuits and their components.
- Demonstrate knowledge of Ohm's law.
- Demonstrate knowledge of units of measure and symbols related to DC electricity.
- Demonstrate knowledge of the instruments and procedures used to measure electricity.
- Demonstrate knowledge of calculations for electricity-related values.
- Demonstrate knowledge of series, parallel and complex DC circuits, their characteristics and operation.
- Demonstrate knowledge of Kirchhoff's law.
- Demonstrate knowledge of calculations for DC circuit values.
- Demonstrate knowledge of DC circuit troubleshooting procedures.

2019 Red Seal Occupational Standard Reference:

Theory only.

Suggested Hours:

30 Hours

Theoretical Objectives:

1. Define terminology associated with DC electricity.
   - i) series DC circuits
   - ii) parallel DC circuits

2. Identify hazards and describe safe work practices pertaining to DC electricity.

3. Explain concepts related to DC electicity.
   - i) atomic structure of matter and electron theory
     - conductors
     - semi-conductors
     - insulators
   - ii) Ohm's Law
   - ii) Kirchoff's Laws
     - current
     - voltage
   - iv) characteristics and operation of series DC circuits
   - v) characteristics and operation of parallel DC circuits

4. Identify instruments used for measuring electricity and describe their applications and procedures for use.

5. Identify units of measure and symbols pertaining to DC electricity.

6. Identify basic components found in DC electric circuits and describe their characteristics and purpose.

7. Identify the basic electrical properties and describe their relationship.
   - i) voltage
   - ii) current
   - iii) resistance
   - iv) power

8. Identify the forms of energy that produce electricity and describe their associated principles.
   - i) chemical action
   - ii) piezoelectric effect
   - iii) mechanical/magnetism
   - iv) heat
   - v) light and solar
   - vi) friction

9. Identify types of complex DC circuits and describe their characteristics and operation.
   - i) series-parallel
   - ii) parallel-series

10. Describe basic electric circuits.
    - i) electron path
      - conductors
    - ii) load
    - iii) source
    - iv) control

11. Describe the procedures used to troubleshoot series, parallel and complex DC circuits.

12. Perform calculations related to DC electricity.
    - i) determining electricity-related values in simple circuits
      - voltage
      - current
      - resistance
      - power
    - ii) determining series, parallel and complex DC circuit related values

Practical Objectives:

N/A

PLT-130 Single-Phase AC Theory

Learning Outcomes:

- Demonstrate knowledge of single-phase electricity, its characteristics and associated principles.
- Demonstrate knowledge of AC components and their characteristics.
- Demonstrate knowledge of calculations for single-phase circuit values.

2019 Red Seal Occupational Standard Reference:

9.01 Strings overhead conductors and cables.
16.01 Operates transmission systems.
16.02 Operates distribution systems.
16.03 Performs station switching.
17.01 Inspects distribution and transmission systems.
17.02 Maintains pole structures.
17.03 Maintains steel lattice structures.
17.04 Maintains system components.
18.01 Troubleshoots overhead distribution systems.
18.02 Troubleshoots underground and underwater distribution systems.
18.03 Repairs overhead distribution systems.
18.04 Repairs underground and underwater distribution systems.
19.01 Troubleshoots overhead transmission systems.
19.02 Troubleshoots underground and underwater transmission systems.
19.03 Repairs overhead transmission systems.
19.04 Repairs underground and underwater transmission systems.

Suggested Hours:

27 Hours

Theoretical Objectives:

1. Define terminology associated with single-phase electricity.

2. Identify hazards and describe safe work practices pertaining to single-phase electricity.

3. Explain the principles related to single-phase AC theory.
   i) magnetism
   ii) electromagnetism
   iii) electromagnetic induction

4. Explain alternating current (AC).
   i) sine wave values and characteristics

- instantaneous
- peak
- peak to peak
- RMS
- average
    - DC level

5. Identify units of measure and symbols pertaining to single-phase electricity.

6. Identify types of components found in AC circuits and describe their characteristics.
    i) resistors
    ii) inductors
    iii) capacitors

7. Identify the types of electromagnetic induction and describe their characteristics and applications.
    i) self induction
    ii) mutual induction

8. Perform calculations pertaining to single-phase theory.

Practical Objectives:

N/A

PLT-135 Single-Phase AC Circuits I

Learning Outcomes:

- Demonstrate knowledge of series and parallel AC circuits and components, their characteristics and operation.
- Demonstrate knowledge of calculations for AC series and parallel circuit values.
- Demonstrate knowledge of calculations for AC three-wire circuit values.
- Demonstrate knowledge of AC circuit troubleshooting procedures.

2019 Red Seal Occupational Standard Reference:

9.01 Strings overhead conductors and cables.
16.01 Operates transmission systems.
16.02 Operates distribution systems.
16.03 Performs station switching.
17.01 Inspects distribution and transmission systems.
17.02 Maintains pole structures.
17.03 Maintains steel lattice structures.
17.04 Maintains system components.
18.01 Troubleshoots overhead distribution systems.
18.02 Troubleshoots underground and underwater distribution systems.
18.03 Repairs overhead distribution systems.
18.04 Repairs underground and underwater distribution systems.
19.01 Troubleshoots overhead transmission systems.
19.02 Troubleshoots underground and underwater transmission systems.
19.03 Repairs overhead transmission systems.
19.04 Repairs underground and underwater transmission systems.

Suggested Hours:

18 Hours

Theoretical Objectives:

1. Define terminology associated with series and parallel AC circuits.

2. Explain the characteristics and operation of AC circuits.
   i) series
   ii) parallel

3. Explain Kirchoff's Laws.
   i) current
   ii) voltage

4. Identify types of components found in AC circuits and describe their characteristics and applications.
   i) resistors
   ii) inductors
   iii) capacitors

5. Describe the procedures used to troubleshoot series and parallel AC circuits.

6. Explain single-phase three-wire systems and describe their characteristics, purpose, and operation.

7. Perform calculations related to single-phase AC circuits.
   i) series and parallel AC circuit related values
      - resistance in series/parallel
      - inductance in series/parallel
      - capacitance in series/parallel
   ii) single-phase three-wire system calculations
      - Edison three-wire
      - open neutral circuit values

Practical Objectives:

N/A

PLT-140 Introduction to Live-Line Methods

Learning Outcomes:

- Demonstrate knowledge of live-line work and its applications.
- Demonstrate knowledge of the regulatory requirements pertaining to safety.
- Demonstrate knowledge of the principles of live-line work.
- Demonstrate knowledge of the procedures to use cover-up.
- Demonstrate knowledge of the procedures used to perform live-line work.

2019 Red Seal Occupational Standard Reference:

1.02 Controls powerline hazards.
5.01 Uses cover-up.

Suggested Hours:

6 Hours

Theoretical Objectives:

1. Define terminology associated with live-line work and live-line work using cover-up.

2. Identify hazards and describe safe work practices pertaining to live-line work and live-line work using cover-up.

3. Interpret jurisdictional codes, standards and regulations pertaining to live-line work and live-line work using cover-up.

4. Identify tools and equipment used for live-line work and live-line work using cover-up and describe their applications and procedures for use.
   i) live-line work
      - FRP (hot sticks)
      - insulated aerial devices
      - rubber gloves
   ii) cover-up
      - rigging
      - live-line tools
      - hose/stick bag
      - clothes pins

5. Identify line protection requirements related to live-line work and live-line work using cover-up.

6. Identify class and types of cover-up and describe their applications.

i) line hose
ii) solid blanket
iii) split blanket
iv) insulator hood
v) hard covers

7. Identify types of live-line work and describe their applications.
   i) FRP tools (hot sticks)
   ii) rubber glove
   iii) bare hand

8. Describe principles of live-line work and live-line work using cover-up.

9. Describe the procedures used to perform live-line work and live-line work using cover-up.
   i) hold-offs
   ii) tailboard
   iii) limits of approach
   iv) work permits
   v) lockout and tagout

Practical Objectives:

N/A

PLT-145 Communication Techniques

Learning Outcomes:

- Demonstrate knowledge of trade terminology.
- Demonstrate knowledge of effective communication practices.

2019 Red Seal Occupational Standard Reference:

6.01 Uses communication techniques.

Suggested Hours:

3 Hours

Theoretical Objectives:

1. Define terminology used in the trade.

2. Describe the importance of using effective verbal and non-verbal communication with people in the workplace.
   - i) other tradespeople
   - ii) colleagues
   - iii) apprentices
   - iv) supervisors
   - v) customers
   - vi) jurisdictional authorities
   - vii) manufacturers

3. Identify sources of information to effectively communicate.
   - i) jurisdictional regulations
   - ii) standards
   - iii) codes
   - iv) occupational health and safety requirements
   - v) jurisdictional authority requirements
   - vi) prints
   - vii) drawings
   - viii) operating maps
   - ix) specifications
   - x) company and customer documentation

4. Identify communication and learning styles.
   - i) learning styles
     - seeing it
     - hearing it

- trying it

5. Describe effective listening and speaking skills.

6. Identify personal responsibilities and attitudes that contribute to on-the-job success.
   i) asking questions
   ii) working safely
   iii) accepting constructive feedback
   iv) time management and punctuality
   v) respect for authority
   vi) good stewardship of materials
   vii) tools and property
   viii) efficient work practices
   ix) personal work ethics
   x) responsibility for own actions

7. Identify the value of diversity in the workplace.

8. Identify communication that constitutes harassment and discrimination.
   i) harassment
      - objectionable conduct
      - comment or display made either on a one-time or continuous basis that demeans, belittles, or causes personal humiliation or embarrassment to the recipient
   ii) discrimination
      - race
      - national or ethnic origin
      - colour
      - religion
      - age
      - sex
      - sexual orientation
      - gender identity or expression
      - marital status
      - family status
      - disability
      - genetic characteristics
      - pardoned conviction

Practical Objectives:

N/A

PLT-150 Pole Structures

Learning Outcomes:

- Demonstrate knowledge of pole structures, their components, characteristics and applications.
- Demonstrate knowledge of the procedures used to frame pole structures, their components and accessories.
- Demonstrate knowledge of the principles of setting pole structures.
- Demonstrate knowledge of the procedures used to set pole structures.
- Demonstrate knowledge of the principles of pole guys and anchors and their applications for use.
- Demonstrate knowledge of the procedures used to install pole guys and anchors.

2019 Red Seal Occupational Standard Reference:

7.01 Frames pole structures.
7.02 Sets pole structures.
7.03 Installs pole structure guys and anchors.

Suggested Hours:

9 Hours

Theoretical Objectives:

1. Define terminology associated with pole structures.
    i) framing and setting pole structures and their components
    ii) guys and anchors
        - down
        - span
        - sidewalk
            - struts
        - push brace

2. Identify hazards and describe safe work practices related to pole structures.
    i) framing and setting pole structures and their components
    ii) installation of guys and anchors

3. Interpret codes, standards and jurisdictional regulations related to pole structures.
    i) framing and setting pole structures and their components
    ii) installation of guys and anchors

4. Interpret information related to pole structures found on drawings and specifications.
    i) framing and setting pole structures and their components

ii) installation of guys and anchors

5. Identify tools and equipment related to pole structures and describe their applications and procedures for use.
   i) framing pole structures and their components
      - cant hook
      - framing pole cradle
      - drill
   ii) setting of pole structures
      - radial boom derrick (RBD)
      - cant hook
      - insulated pole tongs
   iii) installation of guys and anchors
      - chain hoists
      - RBD
      - slings
      - grips

6. Identify types of pole structures and their components and describe their characteristics and applications.
   i) single-pole
   ii) multi-pole
   iii) tangent
   iv) angle
   v) dead-end
   vi) take-off (or tap)
   vii) joint use construction
   viii) self-supporting poles
      - wood
      - steel
      - fibreglass
      - concrete
      - laminate
   ix) pole stamp information
      - length
      - class
      - treatment type
      - pole type
      - date
      - manufacturer
   x) pole support structures
      - cribs
      - tri-anchor

xi) defects
- knots
- rotting

7. Identify types of guys and anchors and describe their characteristics and applications.
i) guys
- down
- span
- sidewalk
  - struts
- push brace

ii) anchors
- helix
- rock
- cross plates
- expansion
- log

8. Identify types of equipment components.
i) pole mounted transformers
ii) single-phase switching points
iii) three-phase switching points
iv) capacitor banks
v) regulator banks
vi) reclosers

9. Identify guy and anchor attachments and describe their characteristics and applications.
i) preforms
ii) anchor eye nuts
iii) three-bolt clamps

10. Identify hardware and pole structure component accessories and describe their characteristics and applications.
i) hardware
- bolts
- nuts
- washers

ii) structure components
- crossarms
- insulators
- pole top pins

11. Describe the procedures related to pole structures.
    i) frame pole structures, their components and accessories
    ii) set pole structures
    iii) install guys and anchors

12. Perform calculations related to pole structures.
    i) guy tension
    ii) compressive force
    iii) lead to height ratio
    iv) pole depth

Practical Objectives:

N/A

PLT-155 Steel Lattice Structures I

Learning Outcomes:

- Demonstrate knowledge of assembling steel lattice structures, their components, characteristics and applications.
- Demonstrate knowledge of the procedures used to assemble steel lattice structures and their components.
- Demonstrate knowledge of the procedures used to erect steel lattice structures.
- Demonstrate knowledge of the procedures used to erect steel lattice structures and their components.
- Demonstrate knowledge of guy wires and anchors, their characteristics and applications.
- Demonstrate knowledge of the procedures used to install guy wires and anchors.

2019 Red Seal Occupational Standard Reference:

8.01 Assembles steel lattice structures.
8.02 Erects steel lattice structures.
8.03 Installs steel lattice structure guy wires and anchors.

Suggested Hours:

6 Hours

Theoretical Objectives:

1. Define terminology associated with steel lattice structures.

2. Identify hazards and describe safe work practices related to steel lattice structures.
   i) assembly and erecting
   ii) installing guy wire and anchors

3. Interpret standards and jurisdictional regulations related to steel lattice structures.
   i) assembly of steel lattice structures
   ii) installation of guy wires and anchors

4. Interpret information related to steel lattice structures found on drawings and specifications.
   i) assembling and erecting steel lattice structures
   ii) installation of guy wires and anchors

5. Identify tools and equipment related to steel lattice structures and describe their applications and procedures for use.
   i) assembling and erecting steel lattice structures
      - torque wrench

- impact drill
- slings
- cranes
- helicopters

ii) installation of guy wires and anchors
- chain hoists
- RBD
- grips
- dynamometer

6. Identify types of steel lattice structures and describe their characteristics and applications.
   i) dead-end
   ii) corner
   iii) tangent

7. Identify types of guy wires and anchors and describe their characteristics and applications.
   i) helix
   ii) rock
   iii) cross plates
   iv) expansion

8. Describe the procedures related to steel lattice structures.
   i) assemble steel lattice structures and their components
   ii) erect steel lattice structures and their components
   iii) install guy wires and anchors

Practical Objectives:

N/A

PLT-160 Introduction to Single-Phase Transformers

Learning Outcomes:

- Demonstrate knowledge of single-phase transformer components, their applications and operation.
- Demonstrate knowledge of the procedures used to install single-phase transformers.

Red Seal Occupational Standard Reference:

12.01 Installs transformers.
12.04 Installs switches.

Suggested Hours:

6 Hours

Theoretical Objectives:

1. Define terminology associated with single-phase transformers.

2. Identify hazards and describe safe work practices pertaining to single-phase overhead transformers.

3. Interpret codes, standards and regulations pertaining to single-phase overhead transformers.

4. Interpret information pertaining to single-phase overhead transformers found on nameplates, drawings and specifications.

5. Identify tools and equipment related to single-phase transformers and describe their applications and procedures for use.
   i) drills
   ii) AWP
   iii) FRP tools (hot sticks)
   iv) multi-meter
   v) transformer tester

6. Identify overhead single-phase distribution transformers and describe their applications.

7. Identify single-phase overhead 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
xi) fault indicators

8. Describe the procedures used to install overhead single-phase transformers.

9. Describe the procedures used to parallel overhead single-phase transformers.

Practical Objectives:

N/A

PLT-165 Communication Lines

Learning Outcomes:

- Demonstrate knowledge of communication lines and their operating principles.
- Demonstrate knowledge of the procedures used to transfer communication lines.

2019 Red Seal Occupational Standard Reference:

15.02 Transfers communication lines.

Suggested Hours:

3 Hours

Theoretical Objectives:

1. Define terminology associated with communication lines.

2. Identify hazards and describe safe work practices related to transferring communication lines.

3. Interpret codes, standards and regulations related to communication lines.

4. Identify tools and equipment related to transferring communication lines and describe their applications and procedures for use.
   i) drills
   ii) wrenches
   iii) rigging equipment

5. Identify types of communication lines and describe their applications.
   i) fibre
   ii) coaxial
   iii) telephone

6. Describe the procedures used to transfer communication lines.

Practical Objectives:

N/A

PLT-170 Non-Tension Stringing

Learning Outcomes:

- Demonstrate knowledge of overhead conductors and cables, their characteristics and applications.
- Demonstrate knowledge of conductor and cable protection methods, procedures and their applications.
- Demonstrate knowledge of distribution lines, their applications and operation.
- Demonstrate knowledge of the procedures used to string distribution lines.

2019 Red Seal Occupational Standard Reference:

9.01 Strings overhead conductors and cables.

Suggested Hours

6 Hours

Theoretical Objectives:

1. Define terminology associated with overhead conductors and cables.

2. Identify hazards and describe safe work practices pertaining to overhead conductors and cables.

3. Interpret information pertaining to overhead conductors and cables found on drawings and specifications.

4. Interpret utility standards pertaining to overhead conductors and cables.

5. Identify tools and equipment related to non-tension stringing of overhead conductors and cables and describe their applications and procedures for use.
   i) pulling equipment
   ii) non-tension stringing equipment
   iii) grounding equipment
   iv) break-a-ways
   v) running blocks

6. Identify types of overhead conductors and cables and describe their characteristics and applications.
   i) transmission
   ii) distribution

7. Identify the considerations and requirements for selecting overhead conductors and cables.

8. Identify conductor and cable protection methods and describe their characteristics, procedures and applications.
   i) mechanical
   ii) electrical

9. Describe the procedures used to string overhead conductors and cables using the non-tension stringing method.

10. Describe conductor and cable protection methods used to provide electrical protection.

Practical Objectives:

N/A

PLT-175 Sag Conductors

Learning Outcomes:

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

2019 Red Seal Occupational Standard Reference:

9.02 Sags overhead conductors and cables.

Suggested Hours:

3 Hours

Theoretical Objectives:

1. Define terminology associated with sagging overhead conductors and cables.

2. Identify hazards and describe safe work practices pertaining to sagging overhead conductors and cables.

3. Interpret codes, standards and regulations pertaining to sagging overhead conductors and cables.

4. Interpret information and perform calculations pertaining to sagging overhead conductors and cables found on drawings and specifications.
   - i) sag charts
   - ii) temperature
   - iii) conductor type
   - iv) weights and tensions
   - v) span length

5. Explain the effects of sagging on overhead conductors and cables.

6. Identify tools and equipment related to sagging overhead conductors and cables and describe their applications and procedures for use.
   - i) jacks
   - ii) slings
   - iii) chains
   - iv) grips
   - v) sag boards
   - vi) scopes
   - vii) transits
   - viii) dynamometer

7. Identify types and sizes of overhead conductors and cables and describe their characteristics and applications.

8. Identify the considerations and requirements for selecting dead-ends for overhead conductors and cables.

9. Describe the procedures used to sag overhead conductors and cables.

Practical Objectives:

N/A

PLT-180 Overhead Conductors and Cable Tie-Ins

Learning Outcomes:

- Demonstrate knowledge of overhead conductor and cable tie-ins and components.
- Demonstrate knowledge of conductor and cable protection methods used for tie-ins.
- Demonstrate knowledge of distribution and transmission lines, their components, applications and operation.

2019 Red Seal Occupational Standard Reference:

9.03 Ties-in overhead conductors and cables.

Suggested Hours:

3 Hours

Theoretical Objectives:

1. Define terminology associated with overhead conductor and cable tie-ins and components.

2. Identify hazards and describe safe work practices pertaining to overhead conductor and cable tie-ins and components.

3. Interpret utility standards pertaining to overhead conductor and cable tie-ins and components.

4. Interpret information pertaining to overhead conductor and cable tie-ins and components found on drawings and specifications.

5. Identify tools and equipment related to tying in overhead conductor and cable tie-ins and components and describe their applications and procedures for use.
   i) lineman pliers
   ii) ratchets
   iii) wrenches
   iv) cordless impact driver

6. Identify overhead conductor and cable tie-ins and components.
   i) dampers
   ii) spacers
   iii) aerial markers
   iv) armour rods

7. Identify the considerations and requirements for selecting overhead conductor and cable tie-ins and components.

8. Identify conductor and cable protection methods used for tie-ins.
   i) mechanical
   ii) electrical

9. Identify materials used to secure conductors to the insulator.
   i) clamp style
   ii) pre-formed pin top tie
   iii) tie wire

10. Describe conductor and cable protection methods used to provide mechanical protection and support.

Practical Objectives:

N/A

PLT-185 Splices and Connections

Learning Outcomes:

- Demonstrate knowledge of splices and connections for overhead conductors and cables.
- Demonstrate knowledge of conductor and cable protection methods for splices and connections.
- Demonstrate knowledge of the procedures used to splice conductors and cables.

2019 Red Seal Occupational Standard Reference:

9.04 Installs splices and connections to overhead conductors and cables.

Suggested Hours:

3 Hours

Theoretical Objectives:

1. Define terminology associated with splices and connections for overhead conductors and cables.

2. Identify hazards and describe safe work practices pertaining to splices and connections for conductors and cables.

3. Interpret utility standards pertaining to splices and connections for overhead conductors and cables.

4. Interpret information pertaining to splices and connections for overhead conductors and cables found on drawings and specifications.

5. Identify tools and equipment related to splices and connections for overhead conductors and cables and describe their applications and procedures for use.
   i) wire brushes
   ii) cable cutters
   iii) presses
   iv) jacks
   v) powder-actuated tools

6. Identify types of splices and connections used for overhead conductors and cables and describe their characteristics and applications.

7. Identify conductor and cable protection methods for splices and connections, describe their characteristics, procedures and applications.
   i) mechanical

ii) electrical
iii) implosive

8. Describe conductor and cable protection methods used to provide electrical protection for splices and connections.

9. Describe the procedures used to splice conductors and cables.

Practical Objectives:

N/A

Level 2

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PLT-200 Single-Phase AC Circuits II

Learning Outcomes:

- Demonstrate knowledge of series and parallel AC circuits and components, their characteristics and operation.
- Demonstrate knowledge of calculations for AC circuit-related values.

2019 Red Seal Occupational Standard Reference:

9.01 Strings overhead conductors and cables.
16.01 Operates transmission systems.
16.02 Operates distribution systems.
16.03 Performs station switching.
17.01 Inspects distribution and transmission systems.
17.02 Maintains pole structures.
17.03 Maintains steel lattice structures.
17.04 Maintains system components.
18.01 Troubleshoots overhead distribution systems.
18.02 Troubleshoots underground and underwater distribution systems.
18.03 Repairs overhead distribution systems.
18.04 Repairs underground and underwater distribution systems.
19.01 Troubleshoots overhead transmission systems.
19.02 Troubleshoots underground and underwater transmission systems.
19.03 Repairs overhead transmission systems.
19.04 Repairs underground and underwater transmission systems.

Suggested Hours:

30 Hours

Theoretical Objectives:

1. Define terminology associated with series and parallel AC circuits.

2. Explain the effects of electrical components found in series AC circuits.
   - i) resistance
   - ii) reactance
     - inductive reactance
     - capacitive reactance
   - iii) impedance

3. Explain the effects of electrical components found in parallel AC circuits.
   i) resistance
   ii) reactance
      - inductive reactance
      - capacitive reactance
   iii) impedance

4. Identify units of measure and symbols pertaining to single-phase AC circuits and components.

5. Perform calculations to determine series and parallel AC circuit-related values.
   i) inductive reactance
   ii) capacitive reactance
   iii) RL
   iv) RC
   v) RLC
   vi) phase angle
   vii) true power, apparent power, reactive power
   viii) power factor
   ix) impedance

Practical Objectives:

N/A

PTN-205 Live-Lines I

Learning Outcomes:

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

2019 Red Seal Occupational Standard Reference:

5.02 Uses rubber gloves.

Suggested Hours:

51 Hours

Theoretical Objectives:

1. Define terminology associated with live-line work using rubber gloves.

2. Identify hazards and describe safe work practices related to live-line work using rubber gloves.

3. Interpret codes, standards and regulations related to live-line work using rubber gloves.

4. Interpret information related to live-line work using rubber gloves found on drawings and specifications.

5. Identify tools and equipment used for live-line work using rubber gloves and describe their applications, procedures for use, and testing and inspection requirements.
   i) rubber gloves
      - classifications
      - ratings
      - types
      - covers
   ii) insulated aerial device
   iii) current leakage meter
   iv) rubber/rigid protective cover up

6. Identify types of live-line work using rubber gloves and describe their applications.
   i) FRP tools
   ii) rubber glove

7. Identify line protection requirements related to live-line work using rubber gloves.

8. Describe the procedures used to perform live-line work using rubber gloves.

9. Describe principles of live-line work using rubber gloves.

10. Interpret information and perform calculations pertaining to live-line methods.
    i) live-line work and live-line work using cover-up found in drawings, procedures and specifications
    ii) live-line rigging and cover-up
        - weights and tensions
        - working load limits (WLL)
        - safe working loads (SWL)

Practical Objectives:

1. Perform a Tailboard Conference.

2. Perform vehicle and equipment checks.

3. Perform dielectric boom leakage test on aerial device for using rubber glove live-line procedures.

4. Layout and set up proper rubber protective equipment, rigid cover-up as required, hot line tools, and proper rubber gloves.

5. Perform insulator changes on various structure types using proper rubber glove live-line procedures.

6. Perform cross-arm changes on various structure types using proper rubber glove live-line procedures.

PTN-210 Tension Stringing

Learning Outcomes:

- Demonstrate knowledge of overhead conductors and cables, their characteristics and applications.
- Demonstrate knowledge of conductor and cable protection methods, procedures and their applications.
- Demonstrate knowledge of distribution lines, their applications and operation.
- Demonstrate knowledge of the procedures used to string distribution lines.

2019 Red Seal Occupational Standard Reference:

5.01 Uses cover-up.
9.01 Strings overhead conductors and cables.
9.02 Sags overhead conductors and cables.
9.03 Ties-in overhead conductors and cables.
9.04 Installs splices and connections to overhead conductors and cables.

Suggested Hours:

12 Hours

Theoretical Objectives:

1. Define terminology associated with overhead conductors and cables.

2. Identify hazards and describe safe work practices pertaining to overhead conductors and cables.

3. Interpret utility standards pertaining to overhead conductors and cables.

4. Interpret information pertaining to overhead conductors and cables found on drawings and specifications.

5. Identify tools and equipment related to tension stringing overhead conductors and cables and describe their applications and procedures for use.
   i) pulling equipment
   ii) tension stringing equipment
   iii) grounding equipment
   iv) cover-up
   v) travellers

6. Identify types of overhead conductors and cables and describe their characteristics and applications.
   i) transmission
   ii) distribution

7. Identify the considerations and requirements for selecting overhead conductors and cables.

8. Identify conductor and cable protection methods and describe their characteristics, procedures and applications.
   i) mechanical
   ii) electrical

9. Describe the procedures used to string overhead conductors and cables using the tension stringing method.

10. Describe the procedures related to overhead conductors and cables using the tension stringing method.
    i) sag overhead conductors and cables
    ii) tie-in overhead conductors and cables
    iii) install splices and connections to overhead conductors and cables

11. Describe conductor and cable protection methods used to provide electrical protection.

Practical Objectives:

1. String, sag and tension primary conductors.

PLT-215 Underground and Underwater Cable

Learning Outcomes:

- Demonstrate knowledge of underground, underwater and direct buried systems, their components, characteristics and applications.
- Demonstrate knowledge of cable protection methods and their applications.
- Demonstrate knowledge of underground and underwater system construction principles.
- Demonstrate knowledge of the procedures used to install underground, underwater and direct buried systems, and their components.
- Demonstrate knowledge of underground and underwater splices for cables, their characteristics and applications.
- Demonstrate knowledge of the procedures used to splice and test underground and underwater cables.
- Demonstrate knowledge of underground and underwater cable terminations.

2019 Red Seal Occupational Standard Reference:

10.01 Installs conduit and cable.
10.02 Places direct buried cable.
10.03 Splices underground and underwater cable.
10.04 Terminates underground and underwater cable.

Suggested Hours:

33 Hours

Theoretical Objectives:

1. Define terminology associated with underground and underwater cables.

2. Identify hazards and describe safe work practices pertaining to underground and underwater cables.
   i) underground, underwater and direct buried systems and their components
   ii) splices and terminations

3. Interpret codes, regulations and standards related to underground and underwater cables.
   i) underground, underwater and direct buried systems
   ii) utility standards pertaining to underground and underwater cable splices and terminations

4. Interpret information pertaining to underground and underwater cables found on drawings and specifications.
   i) underground, underwater and direct buried systems
   ii) splices and terminations

5. Explain the principles of underground, underwater and direct buried systems construction.

6. Identify tools and equipment related to underground, underwater and direct buried systems, and describe their applications and procedures for use.
   i) installation
      - trenchers
      - vibratory plow
      - directional drill
      - backhoe
      - tamper
      - shovel
      - tugger
      - winch
      - swivel
      - cable pulling sock
   ii) splicing and terminating
      - wire brushes
      - cable cutters
      - cable strippers
      - presses
      - tape measure
      - ratchets
      - hacksaws
      - lineman pliers
      - hack knife
      - hatchet
      - heat gun

7. Identify types of underground and underwater systems and describe their characteristics and applications.
   i) radial
   ii) loop
   iii) network

8. Identify types of direct buried underground and underwater cables used in systems and describe their characteristics and applications.

9. Identify types of underground and underwater cable splices and terminations and describe their characteristics and applications.
    i) sleeves
        - mechanical
        - compression
    ii) terminations

10. Identify underground, underwater and direct buried system components and describe their characteristics and applications.
    i) cables
        - concentric neutral
        - non-shielded
        - shielded
    ii) cable protection
    iii) system grounds
    iv) conduit
    v) duct systems
    vi) direct-buried systems

11. Identify cable protection methods and describe their characteristics and applications.
    i) mechanical
    ii) electrical

12. Describe the procedures related to underground and underwater cables.
    i) protect underground, underwater, direct buried cables, splices, and terminations
    ii) install underground, underwater, direct buried systems, and their components
    iii) cut, strip and splice underground and underwater cables
    iv) terminate underground and underwater cables
    v) test underground and underwater cables
        - termination test methods
            - ultra-low frequency (ULF)
            - very low frequency (VLF)
            - resistance test
            - high potential test

Practical Objectives:

1. Install duct systems.

2. Install underground cables and conductors.

3. Perform splices and terminations on underground cables and conductors.

4. Install underground residential distribution systems.

PTN-220 Lighting Systems

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, their components and accessories.
- Demonstrate knowledge of the procedures used to store and dispose of ballasts, capacitors and lamps.

2019 Red Seal Occupational Standard Reference:

11.01 Installs street lights.
11.02 Maintains street lights.

Suggested Hours:

15 Hours

Theoretical Objectives:

1. Define terminology associated with street lighting systems.

2. Identify hazards and describe safe work practices related to lighting systems.
   i) installation of street lighting systems
   ii) storage and disposal of ballasts, capicitors and lamps

3. Interpret codes, standards and regulations related to street lighting systems.

4. Identify tools and equipment related to street lighting systems and describe their applications and procedures for use.
   i) drills
   ii) AWP
   iii) compression tools
   iv) multi-meters

5. Identify types of street lighting systems and describe their characteristics and applications.
   i) light-emitting diode (LED)
   ii) cascade
   iii) pilot wire

6. Identify street lighting system components and accessories and describe their characteristics and applications.
   i) lamps
   ii) bird stops
   iii) photocells
   iv) installation arms
   v) starter
   vi) ballast
   vii) capacitors

7. Identify considerations and requirements for selecting street lighting system components and accessories.

8. Describe the procedures used in relation to lighting systems.
   i) inspect and maintain street lighting systems, their components and accessories
   ii) install and connect street lighting systems, their components and accessories
   iii) troubleshoot, repair and test street lighting systems, their components and accessories
   iv) store and dispose of ballasts, capacitors and lamps

Practical Objectives:

1. Install and connect streetlights.

PTN-225 Single-Phase Transformers

Learning Outcomes:

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

2019 Red Seal Occupational Standard Reference:

12.01 Installs transformers.
12.04 Installs switches.

Suggested Hours:

18 Hours

Theoretical Objectives:

1. Define terminology associated with single-phase transformers.

2. Identify hazards and describe safe work practices pertaining to single-phase transformers.

3. Interpret codes, standards and regulations pertaining to single-phase transformers.

4. Interpret information pertaining to single-phase transformers found on nameplates, drawings and specifications.

5. Explain single-phase transformer operating principles and their applications.

6. Identify tools and equipment related to single-phase transformers and describe their applications and procedures for use.
   i) drills
   ii) AWP
   iii) FRP tools (hot sticks)
   iv) multi-meter
   v) transformer tester

7. Identify types of single-phase distribution transformers and describe their applications.
   i) pole-mounted
   ii) pad-mounted
      - live front
      - dead front

iii) submersible
iv) platform

8. Identify single-phase 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
   xi) fault indicators

9. Describe the procedures used to install and parallel single-phase transformers.

10. Perform calculations related to single-phase transformer windings.

Practical Objectives:

1. Install, connect and remove pole-mounted single-phase transformers.
   i) parallel 2 single-phase transformers
   ii) perform voltage and load checks

PTN-230 Single-Phase Switches

Learning Outcomes:

- Demonstrate knowledge of single-phase switches, their characteristics and applications.
- Demonstrate knowledge of operating principles of single-phase switches.
- Demonstrate knowledge of the procedures used to install single-phase switches.

2019 Red Seal Occupational Standard Reference:

12.04 Installs switches.

Suggested Hours:

12 Hours

Theoretical Objectives:

1. Define terminology associated with switches.

2. Identify hazards and describe safe work practices pertaining to switches.

3. Interpret codes, standards and regulations pertaining to switches.

4. Interpret information pertaining to switches found on drawings and specifications.

5. Explain concepts related to switches.
   i) operating principles of switches
   ii) switches and their applications related to line protection
   iii) principles related to switching and protection coordination

6. Identify tools and equipment related to switches and describe their applications and procedures for use.
   i) drills
   ii) compression tools
   iii) FRP tools (hot sticks)
   iv) powder-actuated tools
   v) load breaking tools

7. Identify types of switches and describe their characteristics and applications.
   i) load break
   ii) non-load break
   iii) single-phase
      - fused
      - non-fused

8. Identify switch components and describe their characteristics and applications.

9. Identify the considerations and requirements for selecting switches.

10. Describe the procedures used to install and operate switches and their components.

Practical Objectives:

1. Install and remove single-phase cutout.

2. Operate a load breaking tool to open a cutout.

PLT-235 Protection Equipment I

Learning Outcomes:

- Demonstrate knowledge of fuses, their characteristics and applications.
- Demonstrate knowledge of lightning arrestors, their characteristics and applications.
- Demonstrate knowledge of the operating principles of fuses.
- Demonstrate knowledge of operating principles of lightning arrestors.
- Demonstrate knowledge of the procedures used to install fuses.
- Demonstrate knowledge of the procedures used to install lightning arrestors.

2019 Red Seal Occupational Standard Reference:

5.04 Uses fiberglass reinforced plastic (FRP) tools (hot sticks).
13.03 Installs fuses.
13.04 Installs lightning arrestors.

Suggested Hours:

9 Hours

Theoretical Objectives:

1. Define terminology associated with fuses and lighting arrestors.

2. Identify hazards and describe safe work practices pertaining to protection equipment.
   i) fuses
   ii) lightning arrestors

3. Interpret standards and regulations pertaining to fuses and lightning arrestors.

4. Interpret information pertaining to fuses and lightning arrestors found on drawings and specifications.

5. Explain concepts related to protection equipment.
   i) operating principles of fuses
   ii) operating principles of lightning arrestors
   iii) fuse applications related to line protection coordination

6. Identify tools and equipment related to fuses and lightning arrestors and describe their applications and procedures for use.
   i) fuses
      - wrenches
      - pliers
      - multi-meters

- FRP tools (hot sticks)

7. Identify types of fuses and describe their characteristics and applications.
   i) expulsion
   ii) bayonet
   iii) current limiting
   iv) fuse limiter

8. Identify types of lightning arrestors and describe their characteristics and applications.

9. Identify fuse components and describe their characteristics and applications.

10. Identify the considerations and requirements for selecting fuses and lightening arrestors.

11. Describe the procedures used to install fuses and lightning arrestors.

Practical Objectives:

N/A

PTN-240 Secondary Metering Equipment

Learning Outcomes:

- Demonstrate knowledge of secondary metering equipment, their components and applications.
- Demonstrate knowledge of secondary metering equipment operating procedures.
- Demonstrate knowledge of the procedures used to remove and install secondary metering equipment.

2019 Red Seal Occupational Standard Reference:

14.02 Installs secondary metering equipment.

Suggested Hours:

12 Hours

Theoretical Objectives:

1. Define terminology associated with secondary metering equipment.

2. Identify hazards and describe safe work practices related to secondary metering equipment.

3. Interpret codes, standards and regulations related to secondary metering equipment.

4. Interpret information related to secondary metering equipment found on drawings and specifications.

5. Explain secondary metering equipment operating procedures.

6. Identify tools and equipment related to secondary metering equipment and describe their applications and procedures for use.
   i) pliers
   ii) screw drivers
   iii) multi-meters
   iv) hex keys
   v) meter pullers

7. Identify smart metering equipment and describe their functions.
   i) collectors
   ii) repeaters

8. Identify types of secondary metering equipment and describe their applications.

i) self-contained
ii) bases

9. Identify types of secondary meters and describe their characteristics and applications.
   i) bi-directional
   ii) transformer rated
   iii) self-contained

10. Identify secondary metering equipment components and describe their functions.

11. Describe the procedures used to remove and install secondary metering equipment.

12. Perform calculations pertaining to secondary meter readings.

Practical Objectives:

1. Perform voltage checks.

2. Install, read, disconnect and reconnect meters.

PLT-245 Introduction to Distribution Systems

Learning Outcomes:

- Demonstrate knowledge of overhead, underground and underwater distribution systems, their characteristics and applications.
- Demonstrate knowledge of the operating procedures for overhead, underground and underwater distribution systems, their components and accessories.

2019 Red Seal Occupational Standard Reference:

5.02 Uses rubber gloves.
5.04 Uses fiberglass reinforced plastic (FRP) tools (hot sticks).
7.01 Frames pole structures.
12.01 Installs transformers.
12.02 Installs capacitors.
12.03 Installs voltage regulators.
12.04 Installs switches.
13.01 Installs reclosers.
13.02 Installs sectionalizers.
16.02 Operates distribution systems.

Suggested Hours:

6 Hours

Theoretical Objectives:

1. Define terminology associated with overhead, underground and underwater distribution systems.

2. Identify hazards and describe safe work practices pertaining to overhead, underground and underwater distribution systems.

3. Interpret codes, standards and regulations pertaining to overhead, underground and underwater distribution systems.

4. Interpret information pertaining to overhead, underground and underwater distribution systems found on drawings and specifications.

5. Identify tools and equipment related to overhead, underground and underwater distribution systems, and describe their applications and procedures for use.
   i) rubber gloves
   ii) load break tools

iii) FRP tools (hot sticks)
iv) temporary grounding system
v) voltage indicators

6. Identify overhead components and accessories used in distribution systems.
   i) transformers
   ii) disconnects
   iii) conductors
   iv) poles
   v) insulators
   vi) reclosers

7. Identify underground and underwater components and accessories used in distribution systems.

8. Identify types of distribution systems and describe their applications.
   i) underground
      - radial
      - loop
      - network
   ii) overhead and underwater
      - radial
      - loop

Practical Objectives:

N/A

PLT-250 Distribution and Transmission Systems Maintenance I

Learning Outcomes:

- Demonstrate knowledge of pole structures, their characteristics, applications and maintenance.
- Demonstrate knowledge of pole structure components and accessories, their characteristics, applications and operation.
- Demonstrate knowledge of the procedures used to maintain pole structures, their components and accessories.
- Demonstrate knowledge of system components, their operation, characteristics and applications.
- Demonstrate knowledge of the procedures used to maintain system components.
- Demonstrate knowledge of the procedures used to maintain protective devices.
- Demonstrate knowledge of tree trimming, equipment, their applications, maintenance and procedures for use.
- Demonstrate knowledge of the techniques and procedures used to trim trees.

2019 Red Seal Occupational Standard Reference:

5.02 Uses rubber gloves.
12.01 Installs transformers.
12.04 Installs switches.
17.02 Maintains pole structures.
17.04 Maintains system components.
17.05 Trims trees.

Suggested Hours:

6 Hours

Theoretical Objectives:

1. Define terminology associated with distribution and transmission system maintenance.
   i) pole structures and their maintenance
   ii) maintenance of system components
   iii) tree trimming

2. Identify hazards and describe safe work practices pertaining to distribution and transmission system maintenance.
   i) pole structures
   ii) system components
   iii) tree trimming
      - electrical
      - public

- gravity
- wood debris

3. Interpret codes, standards and regulations pertaining to the maintenance of system components.

4. Interpret guidelines, codes and regulations pertaining to tree trimming.

5. Interpret information pertaining to pole structures and system components on drawings and specifications.

6. Identify tools and equipment related to distribution and transmission system maintenance and describe their applications and procedures for use.
   i) pole structures
   ii) system components
      - rubber gloves
      - test equipment
      - live-line tools
      - hand tools
      - rigging tools and equipment
   iii) tree trimming
      - chain saws
      - hand saws
      - hydraulic saws
      - mechanical pruning equipment
      - rigging
      - pruning saws
      - AWP
      - chippers

7. Identify types of pole structures related to maintenance and describe their characteristics and applications.
   i) single-pole
   ii) multi-pole
   iii) tangent
   iv) angle
   v) dead-end
   vi) take-off (or tap)
   vii) joint use construction
   viii) self-supporting poles
      - wood
      - steel fiberglass
      - concrete
      - laminate

8. Identify types of system components related to maintenance and describe their characteristics, applications and accessories.
   i) insulators
   ii) transformers
      - single-phase
   iii) guy wires
   iv) conductors and cables
   v) single-phase metering
   vi) line protective devices
      - fuses
      - lightning arrestors

9. Identify pole structure components and accessories related to maintenance and describe their operation.
   i) cross arms
   ii) braces
   iii) nuts and bolts

10. Identify the techniques used to trim trees.

11. Describe the procedures used to maintain pole structures, components and accessories.

12. Describe the procedures used to maintain system components.

13. Describe the procedures used to maintain protective devices, their components and accessories.
   i) air break devices
      - load breaking
      - non-load breaking
   ii) fuses
   iii) lightning arrestors
   iv) current limiting fuses

14. Describe the procedures used to trim trees.

Practical Objectives:

N/A

PTN-255 Overhead Distribution Systems Repair I

Learning Outcomes:

- Demonstrate knowledge of overhead distribution systems, their applications and operation.
- Demonstrate knowledge of overhead distribution system construction principles.
- Demonstrate knowledge of requirements and procedures used in the temporary grounding and bonding of overhead distribution systems.
- Demonstrate knowledge of the procedures used to repair and test overhead distribution system components and accessories.

2019 Red Seal Occupational Standard Reference:

5.02 Uses rubber gloves.
18.03 Repairs overhead distribution systems.

Suggested Hours:

12 Hours

Theoretical Objectives:

1. Define terminology associated with repairing overhead distribution systems.

2. Identify hazards and describe safe work practices pertaining to repairing overhead distribution systems.

3. Interpret codes, standards and regulations pertaining to overhead distribution systems.

4. Interpret information pertaining to overhead distribution systems found on drawings and specifications.

5. Identify tools and equipment related to repairing overhead distribution systems and describe their applications and procedures for use.
   i) live-line tools
   ii) ladders
   iii) chainsaws
   iv) temporary grounding system
   v) gin poles
   vi) rubber gloves
   vii) potential indicators
   viii) rigging tools and equipment
   ix) platform boards

6. Identify types of overhead distribution systems and describe their applications.

7. Identify overhead distribution system components and accessories and describe their characteristics and applications.
   i) transformers
   ii) conductors
   iii) system grounds
   iv) disconnects
   v) poles
   vi) insulators

8. Identify temporary grounding and bonding requirements related to overhead distribution systems.

9. Describe the procedures used for temporary grounding and bonding of overhead distribution systems.

10. Describe the procedures used to repair overhead distribution systems, their components and accessories.

11. Describe the procedures used to test overhead distribution systems, their components and accessories.

Practical Objectives:

1. Install system grounds.

2. Install safety grounding “EPZ” for working on various structures.

3. Install vehicle grounding.

PTN-260 Underground and Underwater Distribution Systems Repair I

Learning Outcomes:

- Demonstrate knowledge of underground and underwater distribution systems, their characteristics and applications.
- Demonstrate knowledge of underground and underwater distribution system construction principles.
- Demonstrate knowledge of requirements and procedures used in the temporary grounding and bonding of underground and underwater distribution systems.
- Demonstrate knowledge of the procedures used to repair and test underground and underwater distribution system components and accessories.
- Demonstrate knowledge of the procedures used to fish, install, splice, cut, strip and terminate cables.

2019 Red Seal Occupational Standard Reference:

18.04 Repairs underground and underwater distribution systems.

Suggested Hours:

15 Hours

Theoretical Objectives:

1. Define terminology associated with repairing underground and underwater distribution systems.

2. Identify hazards and describe safe work practices pertaining to repairing underground and underwater distribution systems.

3. Interpret codes, standards and regulations pertaining to underground and underwater distribution systems.

4. Interpret information pertaining to underground and underwater distribution systems found on drawings and specifications.

5. Identify tools and equipment related to repairing underground and underwater distribution systems and describe their applications and procedures for use.
   i) live-line tools
   ii) temporary grounding system
   iii) potential indicators
   iv) rigging tools and equipment

6. Identify types of underground and underwater distribution systems and describe their characteristics and applications.
   i) underground
      - radial
      - loop
      - network
   ii) underwater
      - radial
      - loop

7. Identify underground and underwater distribution system components and accessories and describe their characteristics and applications.
   i) pad-mounted transformers
   ii) cables
      - concentric neutral
      - non-shielded
      - shielded
   iii) cable protection
   iv) system grounds
   v) duct systems
   vi) direct-buried systems

8. Identify temporary grounding and bonding requirements related to underground and underwater distribution systems.

9. Describe the procedures used for temporary grounding and bonding of underground and underwater distribution systems.

10. Describe the procedures used to repair underground and underwater distribution systems, their components and accessories.

11. Describe the procedures used to test underground and underwater distribution systems, their components and accessories.

12. Describe the procedures used to fish and install cables, their components and accessories.

13. Describe the procedures used to splice underground and underwater cables.

14. Describe the procedures used to cut, strip and terminate underground and underwater cables.

15. Describe operating procedures for underground and underwater distribution systems.

Practical Objectives:

1. Operate and maintain residential distribution systems.

2. Perform operating procedures for switching in an underground system.

3. Use cable locating equipment.

4. Use fault locating equipment.

5. Operate and replace bay-o-net fuses.

PLT-265 Overhead Transmission Systems Repair I

Learning Outcomes:

- Demonstrate knowledge of repairing overhead transmission systems, their applications and operation.
- Demonstrate knowledge of overhead transmission system construction principles.
- Demonstrate knowledge of requirements and procedures used in the temporary grounding and bonding of overhead transmission systems.
- Demonstrate knowledge of the procedures used to repair and test overhead transmission system components and accessories.

2019 Red Seal Occupational Standard Reference:

5.02 Uses rubber gloves.
19.03 Repairs overhead transmission systems.

Suggested Hours:

6 Hours

Theoretical Objectives:

1. Define terminology associated with repairing overhead transmission systems.

2. Identify hazards and describe safe work practices pertaining to repairing overhead transmission systems.

3. Interpret codes, standards and regulations pertaining to overhead transmission systems.

4. Interpret information pertaining to overhead transmission systems found on drawings and specifications.

5. Identify tools and equipment related to repairing overhead transmission systems and describe their applications and procedures for use.
   - i) live-line tools
   - ii) ladders
   - iii) chainsaws
   - iv) temporary grounding system
   - v) gin poles
   - vi) rubber gloves
   - vii) potential indicators
   - viii) rigging tools and equipment
   - ix) platform boards

6. Identify types of overhead transmission systems and describe their characteristics and applications.

7. Identify overhead transmission system components and describe their characteristics and applications.
   i) crossarms
   ii) conductors
   iii) poles
   iv) insulators

8. Identify temporary grounding and bonding requirements related to overhead transmission systems.

9. Describe the procedures used for temporary grounding and bonding of overhead transmission systems.

10. Describe the procedures used to repair overhead transmission systems, their components and accessories.

11. Describe the procedures used to test overhead transmission systems, their components and accessories.

Practical Objectives:

N/A

PLT-270 Underground and Underwater Transmission Systems Repair I

Learning Outcomes:

- Demonstrate knowledge of underground and underwater transmission systems, their characteristics and applications.
- Demonstrate knowledge of underground and underwater transmission system construction principles.
- Demonstrate knowledge of the procedures used in the temporary grounding and bonding of underground and underwater transmission systems.
- Demonstrate knowledge of the procedures used to repair and test underground and underwater transmission system components and accessories.
- Demonstrate knowledge of the procedures used to fish, install, splice cut, strip and terminate cables.

2019 Red Seal Occupational Standard Reference:

19.04 Repairs underground and underwater transmission systems.

Suggested Hours:

3 Hours

Theoretical Objectives:

1. Define terminology associated with repairing underground and underwater transmission systems.

2. Identify hazards and describe safe work practices pertaining to repairing underground and underwater transmission systems.

3. Interpret codes, standards and regulations pertaining to underground and underwater transmission systems.

4. Interpret information pertaining to underground and underwater transmission systems found on drawings and specifications.

5. Identify tools and equipment related to repairing underground and underwater transmission systems and describe their applications and procedures for use.
   i) live-line tools
   ii) temporary grounding system
   iii) potential indicators
   iv) rigging tools and equipment

6. Identify types of underground and underwater transmission systems and describe their characteristics and applications.

7. Identify components used in repairing underground and underwater transmission systems and describe their characteristics and applications.
   i) cables
      - armoured
      - shielded
   ii) cable protection
   iii) system grounds
   iv) duct systems
   v) direct-buried systems
   vi) terminations
   vii) splices

8. Identify temporary grounding and bonding requirements related to underground and underwater transmission systems.

9. Describe the procedures used for temporary grounding and bonding of underground and underwater transmission systems.

10. Describe the procedures used to repair underground and underwater transmission systems, and their components and accessories.

11. Describe the procedures used to test underground and underwater transmission systems, their components and accessories.

12. Describe the procedures used to fish and install cables, their components and accessories.

13. Describe the procedures used to splice underground and underwater transmission cables.

14. Describe the procedures used to cut, strip and terminate underground and underwater transmission cables.

Practical Objectives:

N/A

Level 3

Unit Code	Unit Title	Hours	Page
PLT-300	Three-Phase AC Theory	12	96
PTN-305	Live-Lines II	30	98
PLT-310	Distribution Tension Method	12	100
PTN-315	Three-Phase Transformers	55	102
PTN-320	Voltage Control Equipment I	15	105
PTN-325	Protection Equipment II	15	108
PLT-330	Primary Metering	15	111
PLT-335	Introduction to Transmission Systems	6	113
PLT-340	Distribution and Transmission Systems Maintenance II	6	115
PLT-345	Overhead Distribution Systems Troubleshooting	9	118
PLT-350	Underground and Underwater Distribution Systems Troubleshooting	6	120
PLT-355	Overhead Distribution Systems Repair II	12	123
PTN-360	Underground and Underwater Distribution Systems Repair II	17	125

PLT-300 Three-Phase AC Theory

Learning Outcomes:

- Demonstrate knowledge of three-phase electricity, its characteristics and associated principles.
- Demonstrate knowledge of three-phase electricity calculations.

2019 Red Seal Occupational Standard Reference:

12.01 Installs transformers.

Suggested Hours:

12 Hours

Theoretical Objectives:

1. Define terminology associated with three-phase theory.

2. Identify hazards and describe safe work practices pertaining to three-phase electricity.

3. Identify units of measure and symbols pertaining to three-phase electricity.

4. Explain three-phase power generation.

5. Explain voltage and current relations in three-phase connections.

6. Identify types of three-phase connections and describe their characteristics and applications.
   i) delta
   ii) open delta
   iii) wye

7. Describe the procedures used to measure three-phase electricity.

8. Perform calculations for balanced and unbalanced loads.

9. Perform calculations pertaining to three-phase electricity.
   i) true power
   ii) apparent power
   iii) reactive power
   iv) power factor
   v) power factor correction

Practical Objectives:

N/A

PTN-305 Live-Lines II

Learning Outcomes:

- Demonstrate knowledge of the principles of live-line work using FRP tools (hot sticks).
- Demonstrate knowledge of the procedures to use FRP tools (hot sticks).

2019 Red Seal Occupational Standard Reference:

5.04 Uses fibreglass reinforced plastic (FRP) tools (hot sticks).

Suggested Hours:

30 Hours

Theoretical Objectives

1. Define terminology associated with live-line work using FRP tools (hot sticks).

2. Identify hazards and describe safe work practices pertaining to live-line work using FRP tools (hot sticks).

3. Interpret codes, standards and regulations pertaining to live-line work using FRP tools (hot sticks).

4. Interpret information pertaining to live-line work using FRP tools (hot sticks) found on drawings and specifications.

5. Identify tools and equipment used for live-line work using FRP tools (hot sticks) and describe their applications and procedures for use.

6. Identify types of live-line work using FRP tools (hot sticks) and describe their applications.
   i) hot stick method
   ii) rubber glove
   iii) bare-hand

7. Identify line protection requirements related to live-line work using FRP tools (hot sticks).

8. Describe principles of live-line work using FRP tools (hot sticks).

9. Describe the procedures used to perform live-line work using FRP tools (hot sticks).

10. Interpret information and perform calculations pertaining to live-line rigging using FRP tools (hot sticks).
    i) weights and tensions
    ii) WLL
    iii) SWL

Practical Objectives:

1. Perform insulator changes on various structure types using proper hot stick live-line procedures.

2. Perform cross-arm changes on various structure types using proper hot stick live line procedures.

3. Set- up and use rigging.

PLT-310 Distribution Tension Method

Learning Outcomes:

- Demonstrate knowledge of overhead conductors and cables, their characteristics and applications.
- Demonstrate knowledge of conductor and cable protection methods, procedures and their applications.
- Demonstrate knowledge of distribution lines, their applications and operation.
- Demonstrate knowledge of the procedures used to string distribution lines.
- Demonstrate knowledge of transmission lines, their applications and operation.
- Demonstrate knowledge of the procedures used in temporary grounding and bonding of transmission and distribution lines.

2019 Red Seal Occupational Standard Reference:

5.01 Uses cover-up.
9.01 Strings overhead conductors and cables.
9.02 Sags overhead conductors and cables.
9.03 Ties-in overhead conductors and cables.
9.04 Installs splices and connections to overhead conductors and cables.

Suggested Hours:

12 Hours

Theoretical Objectives:

1. Define terminology associated with overhead conductors and cables.

2. Define terminology associated with distribution lines.

3. Identify hazards and describe safe work practices pertaining to overhead conductors and cables.

4. Identify hazards and describe safe work practices pertaining to distribution lines.

5. Interpret codes, standards and regulations pertaining to distribution lines.

6. Interpret utility standards pertaining to overhead conductors and cables.

7. Interpret information pertaining to distribution lines found on drawings and specifications.

8. Interpret information pertaining to overhead conductors and cables found on drawings and specifications.

9. Identify tools and equipment related to tension stringing overhead conductors and cables and describe their applications and procedures for use.
   i) pulling equipment
   ii) tension stringing equipment
   iii) grounding equipment
   iv) cover-up

10. Identify types of overhead conductors and cables and describe their characteristics and applications used when distribution tension stringing.

11. Identify types of electrical distribution systems and describe their characteristics and applications.

12. Identify conductor and cable protection methods and describe their characteristics, procedures and applications.
   i) mechanical
   ii) electrical

13. Identify temporary grounding and bonding procedures pertaining to distribution lines.

14. Describe the procedures used to string distribution lines using the distribution tension method.

15. Describe the procedures used to sag overhead conductors and cables using the distribution tension stringing method.

16. Describe the procedures used to tie-in overhead conductors and cables using the distribution tension stringing method.

17. Describe the procedures used to install splices and connections to overhead conductors and cables using the distribution tension stringing method.

18. Describe the procedures used for temporary grounding and bonding of distribution lines.

Practical Objectives:

N/A

PTN-315 Three-Phase Transformers

Learning Outcomes:

- Demonstrate knowledge of three-phase transformer operating principles.
- Demonstrate knowledge of three-phase transformer components, their applications and operation.
- Demonstrate knowledge of three-phase transformer connection types, their applications and implications.
- Demonstrate knowledge of self-contained three-phase transformers.
- Demonstrate knowledge of the procedures used to install three-phase transformers.
- Demonstrate knowledge of transformer banking.
- Demonstrate knowledge of the procedures used to bank transformers.
- Demonstrate knowledge of managing hazardous materials associated with transformers.

2019 Red Seal Occupational Standard Reference:

12.01 Installs transformers.

Suggested Hours:

55 Hours

Theoretical Objectives:

1. Define terminology associated with three-phase transformers and transformer banking.

2. Identify hazards and describe safe work practices pertaining to three-phase transformers and transformer banking.

3. Interpret codes, standards and regulations pertaining to three-phase transformers and transformer banking.

4. Interpret information pertaining to three-phase transformers and transformer banking found on nameplates, drawings and specifications.

5. Explain three-phase transformer operating principles and their applications.

6. Explain transformer fusing principles and their applications related to transformer banks.

7. Identify tools and equipment related to three-phase transformers and describe their applications and procedures for use.
   i) drills

ii) AWP
iii) FRP tools (hot sticks)
iv) multi-meter
v) phase rotation meter
vi) transformer tester
vii) compression tool

8. Identify tools and equipment related to transformer banking and describe their applications and procedures for use.

9. Identify types of three-phase distribution transformers and describe their applications.
   i) pole-mounted
   ii) pad-mounted
   iii) submersible
   iv) platform
   v) self-contained three-phase

10. Identify types of transformer connections and describe their applications.
   i) parallel
   ii) delta-delta
   iii) wye-wye
   iv) delta-wye
   v) wye-delta
   vi) open wye-open delta
   vii) open delta-open delta

11. Identify three-phase 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
   xi) fault indicators

12. Identify the characteristics of self-contained three-phase transformers.

13. Identify the considerations for selecting transformer banks to satisfy client needs.

14. Describe the procedures used to install three-phase transformers.

15. Describe the procedures used to install transformer banks.

16. Describe transformer bank wiring configurations.

17. Describe the procedures used for paralleling transformer banks.

18. Describe the procedures used to perform tests on transformer banks.
    i) phase rotation
    ii) voltages
    iii) amperages

19. Describe the procedures used to manage oils and other petroleum products pertaining to transformers.

20. Perform transformer load calculations.

Practical Objectives:

1. Connect and test various transformer connections.

2. Install and connect various transformer banks.

3. Use various measuring instrument.

4. Select proper transformer fusing.

5. Troubleshoot various transformer connections.

PTN-320 Voltage Control Equipment I

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

2019 Red Seal Occupational Standard Reference:

5.04 Uses fibreglass reinforced plastic (FRP) tools (hot sticks).
12.03 Installs voltage regulators.
12.04 Installs switches.

Suggested Hours:

15 Hours

Theoretical Objectives:

1. Define terminology associated with voltage control equipment.
   i) voltage regulators
   ii) switches

2. Identify hazards and describe safe work practices pertaining to voltage control equipment.
   i) voltage regulation and control devices
   ii) switches

3. Interpret codes, standards and regulations pertaining to voltage control equipment.
   i) voltage regulation and control devices
   ii) switches

4. Interpret information pertaining to voltage control equipment found on drawings and specifications.
   i) voltage regulation and control devices
   ii) switches

5. Explain the operating principles of voltage control equipment.
   i) voltage regulators

ii) switches

6. Explain switches and their applications related to line protection.

7. Explain the principles related to switching and protection coordination.

8. Identify tools and equipment related to voltage regulation and control devices and describe their applications and procedures for use.
   i) voltage regulation and control devices
      - AWP
      - drills
      - compression tools
      - FRP tools (hot sticks)
      - multi-meter
      - neutral detector
   ii) switches
      - drills
      - compression tools
      - FRP tools (hot sticks)
      - powder-actuated tools

9. Identify voltage control equipment and accessories and describe their characteristics and applications.
   i) voltage regulation and control devices
      - tap changers
      - voltage regulators
      - auto boosters
   ii) switches
      - three-phase
        - gang operated
      - sequenced
      - non-sequenced

10. Identify the considerations and requirements for selecting voltage control equipment.
    i) voltage regulation and control devices
    ii) switches

11. Identify switch components and describe their characteristics and applications.

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

13. Describe the procedures used to install and operate switches and their components.

Practical Objectives:

1. Operate a regulator control panel.

2. Perform switching procedures to place a regulator ‘in’ service.

3. Perform switching procedures to remove a regulator ‘from’ service.

4. Perform voltage checks at a regulator control panel to determine proper operation.

PTN-325 Protection Equipment II

Learning Outcomes:

- Demonstrate knowledge of reclosers, their characteristics and applications.
- Demonstrate knowledge of the operating principles of reclosers.
- Demonstrate knowledge of the procedures used to install reclosers.
- Demonstrate knowledge of sectionalizers, their characteristics and applications.
- Demonstrate knowledge of the operating principles of sectionalizers.
- Demonstrate knowledge of the procedures used to install sectionalizers.
- Demonstrate knowledge of fuses, their characteristics and applications.
- Demonstrate knowledge of the operating principles of fuses.
- Demonstrate knowledge of the procedures used to install fuses.

2019 Red Seal Occupational Standard Reference:

5.04 Uses fibreglass reinforced plastic (FRP) tools (hot sticks).
13.01 Installs reclosers.
13.02 Installs sectionalizers.
13.03 Installs fuses.

Suggested Hours:

15 Hours

Theoretical Objectives:

1. Define terminology associated protection equipment.
   i) reclosers
   ii) sectionalizers
   iii) fuses

2. Identify hazards and describe safe work practices pertaining to protection equipment.
   i) reclosers
   ii) sectionalizers
   iii) fuses

3. Interpret codes, standards and regulations pertaining to protection equipment.
   i) reclosers
   ii) sectionalizers
   iii) fuses

4. Interpret information pertaining to protection equipment found on drawings and specifications.
   i) reclosers
   ii) sectionalizers
   iii) fuses

5. Explain the operating principles of protection equipment.
   i) reclosers
   ii) sectionalizers
   iii) fuses

6. Explain protection equipment applications related to line protection coordination.
   i) reclosers
   ii) sectionalizers
   iii) fuses

7. Identify tools and equipment related to protection equipment and describe their applications and procedures for use.
   i) reclosers
      - drills
      - AWP
      - FRP tools (hot sticks)
      - powder-actuated tools
   ii) sectionalizers
      - Drills
      - AWP
      - FRP tools (hot sticks)
      - powder-actuated tools
   iii) fuses
      - wrenches
      - pliers
      - multi-meters
      - FRP tools (hot sticks)

8. Identify protection equipment components and describe their characteristics and applications.
   i) reclosers
      - sight glass
      - tank
      - reclosing coil
      - contacts
      - control panels
      - switches
      - bushings
      - open/close indicators

ii) fuses

9. Identify types of protection equipment and describe their characteristics and applications.
   i) reclosers
      - hydraulic units (single and three-phase)
      - vacuum units (single and three-phase)
        - electronic
      - gas (SF6) units (single and three-phase)
        - electronic
      - cut out mounted reclosing device
   ii) sectionalizers
      - hydraulic units
        - single-phase
        - three-phase
      - electronic units
        - single-phase
        - three-phase
      - cut out mounted reclosing device
   iii) fuses
      - power

10. Identify the considerations and requirements for selecting protection equipment.
   i) reclosers
   ii) sectionalizers
   iii) fuses

11. Describe the procedures used to install protection equipment.
   i) reclosers
   ii) sectionalizers
   iii) fuses

Practical Objectives:

1. Perform proper operating procedures necessary to:
   i) place an EOR “in” service
   ii) remove an EOR “from” service
   iii) pick up “cold load” with an EOR

2. Close an EOR manually with the manual closing tool.

3. Place an EOR in “non-reclose” for a “hold-off” using both electronic and manual procedures.

PLT-330 Primary Metering

Learning Outcomes:

- Demonstrate knowledge of primary metering equipment, their components, characteristics and applications.
- Demonstrate knowledge of primary metering equipment operating procedures.
- Demonstrate knowledge of the procedures used to remove and install primary metering equipment.

2019 Red Seal Occupational Standard Reference:

5.04 Uses fibreglass reinforced plastic (FRP) tools (hot sticks).
14.01 Installs primary metering equipment.

Suggested Hours:

15 Hours

Theoretical Objectives:

1. Define terminology associated with primary metering equipment.

2. Identify hazards and describe safe work practices related to primary metering equipment.

3. Interpret codes, standards and regulations related to primary metering equipment.

4. Interpret information related to primary metering equipment found on drawings and specifications.

5. Explain primary metering equipment operating procedures.

6. Identify tools and equipment related to primary metering equipment and describe their applications and procedures for use.
   i) drills
   ii) AWP
   iii) FRP tools (hot sticks)
   iv) powder actuated tools

7. Identify types of primary metering equipment and describe their characteristics and applications.
   i) tank
   ii) cabinet
   iii) metering unit

8. Identify primary metering equipment components and describe their functions.
   i) current transformers (CTs)
   ii) potential transformers (PTs)
   iii) test blocks
   iv) meter base
   v) meter
      - bi-directional
      - transformer rated
      - self-contained

9. Describe the procedures used to remove, install and inspect primary metering equipment.

10. Perform calculations pertaining to primary meter readings.

Practical Objectives:

N/A

PLT-335 Introduction to Transmission Systems

Learning Outcomes:

- Demonstrate knowledge of overhead, underground and underwater transmission systems, their characteristics and applications.

2019 Red Seal Occupational Standard Reference:

5.04 Uses fibreglass reinforced plastic (FRP) tools (hot sticks).
16.01 Operates transmission systems.

Suggested Hours:

6 Hours

Theoretical Objectives:

1. Define terminology associated with overhead, underground and underwater transmission systems.

2. Identify hazards and describe safe work practices pertaining to overhead, underground and underwater transmission systems.

3. Interpret codes, standards and regulations pertaining to overhead, underground and underwater transmission systems.

4. Interpret information pertaining to overhead, underground and underwater transmission systems found on drawings and specifications.
   i) manufacturers' specifications
   ii) engineering
   iii) testing

5. Identify tools and equipment related to overhead, underground and underwater transmission systems and describe their applications and procedures for use.
   i) FRP tools (hot sticks)
   ii) temporary grounding system
   iii) voltage indicators
   iv) circuit breakers
   v) switches

6. Identify types of overhead, underground and underwater transmission systems.

7. Identify overhead, underground and underwater transmission system components and accessories.

Practical Objectives:

N/A

PLT-340 Distribution and Transmission Systems Maintenance II

Learning Outcomes:

- Demonstrate knowledge of distribution and transmission systems, their characteristics and applications.
- Demonstrate knowledge of the procedures used to inspect overhead, underground and underwater distribution and transmission systems.
- Demonstrate knowledge of pole structures, their characteristics and applications, and maintenance.
- Demonstrate knowledge of pole structure components and accessories, their characteristics, applications and operation.
- Demonstrate knowledge of the procedures used to inspect and maintain pole structures, their components and accessories.
- Demonstrate knowledge of the procedures used to inspect and maintain system components.

2019 Red Seal Occupational Standard Reference:

17.01 Inspects distribution and transmission systems.
17.02 Maintains pole structures.
17.04 Maintains system components.

Suggested Hours:

6 Hours

Theoretical Objectives:

1. Define terminology associated with distribution and transmission systems maintenance.
   i) distribution and transmission systems
   ii) pole structures
   iii) system components

2. Identify hazards and describe safe work practices pertaining to distribution and transmission systems maintenance.
   i) inspecting, distribution and transmission systems
   ii) maintenance of pole structures
   iii) maintenance of system components

3. Interpret codes, standards and regulations pertaining to distribution and transmission systems maintenance.
   i) inspecting, distribution and transmission systems
   ii) maintenance of pole structures

iii) maintenance of system components

4. Interpret information pertaining to distribution and transmission systems maintenance found on drawings and specifications.
   i) distribution and transmission systems
   ii) pole structures
   iii) system components

5. Identify tools and equipment pertaining to distribution and transmission systems maintenance and describe their applications and procedures for use.
   i) inspecting distribution and transmission systems
      - thermal imaging
      - insulator testing
   ii) maintenance of pole structures
      - core sampling
   iii) maintenance of system components
      - rubber gloves
      - test equipment
      - live-line tools
      - hand tools
      - rigging tools and equipment

6. Identify types of distribution and transmission systems and describe their characteristics and applications.
   i) underground and underwater
      - radial
      - loop
      - network
   ii) overhead
      - radial
      - loop
      - network

7. Identify types of pole structures and describe their characteristics and applications.
   i) joint use construction
   ii) self-supporting poles
      - wood
      - steel fiberglass
      - concrete
      - laminate

8. Identify types of system components requiring inspection and describe their characteristics, applications and accessories.
   i) transformers
   ii) three-phase metering

9. Identify distribution and transmission system components and describe their applications and operation.
    i) poles
    ii) structures
    iii) footings
    iv) apparatus
    v) transformers
    vi) disconnects
    vii) capacitors

10. Identify pole structure components and accessories and describe their operation.

11. Identify conditions of pole structures that require inspection documentation.
    i) rotten
    ii) infestatation
    iii) fallen
    iv) damaged

12. Describe the procedures used to inspect and maintain overhead, underground and underwater distribution systems, their components and accessories.

13. Describe the procedures used to inspect and maintain overhead, underground and underwater transmission systems, their components and accessories.

14. Describe the procedures used to inspect and maintain pole structures, components and accessories.

15. Describe the procedures used to inspect and maintain system components.

Practical Objectives:

N/A

PLT-345 Overhead Distribution Systems Troubleshooting

Learning Outcomes:

- Demonstrate knowledge of overhead distribution systems, their applications and operation.
- Demonstrate knowledge of overhead distribution system construction principles.
- Demonstrate knowledge of the procedures used to troubleshoot and test overhead distribution systems, their components and accessories.
- Demonstrate knowledge of the procedures used in temporary grounding and bonding of overhead distribution systems.

2019 Red Seal Occupational Standard Reference:

18.01 Troubleshoots overhead distribution systems.

Suggested Hours:

9 Hours

Theoretical Objectives:

1. Define terminology associated with troubleshooting overhead distribution systems.

2. Identify hazards and describe safe work practices pertaining to troubleshooting overhead distribution systems.

3. Interpret standards and regulations pertaining to overhead distribution systems.

4. Interpret information pertaining to overhead distribution systems found on drawings and specifications.

5. Explain principles of overhead distribution system construction.

6. Identify tools and equipment pertaining to troubleshooting overhead distribution systems and describe their applications and procedures for use.

7. Identify types of overhead distribution systems and describe their applications.

8. Identify components and accessories used in overhead distribution systems and describe their characteristics and applications.
   i) transformers
   ii) reclosers
   iii) conductors
   iv) system grounds

v) voltage regulators
vi) disconnects
vii) pole structures
viii) insulators
ix) connections
x) sectionalizers

9. Identify temporary grounding and bonding requirements pertaining to overhead distribution systems.

10. Describe the procedures used to troubleshoot and test overhead distribution systems, their components and accessories.

11. Describe the procedures used for temporary grounding and bonding of overhead distribution systems.

Practical Objectives:

N/A

PLT-350 Underground and Underwater Distribution Systems Troubleshooting

Learning Outcomes:

- Demonstrate knowledge of underground and underwater distribution systems, their applications and operation.
- Demonstrate knowledge of underground and underwater distribution system construction principles.
- Demonstrate knowledge of the procedures used to troubleshoot and test underground and underwater distribution systems, their components and accessories.
- Demonstrate knowledge of the procedures used to fish, install, splice, cut, strip and terminate cables.
- Demonstrate knowledge of the procedures used in temporary grounding and bonding of underground and underwater distribution systems.

2019 Red Seal Occupational Standard Reference:

18.02 Troubleshoots underground and underwater distribution systems.

Suggested Hours:

6 Hours

Theoretical Objectives:

1. Define terminology associated with troubleshooting underground and underwater distribution systems.

2. Identify hazards and describe safe work practices pertaining to troubleshooting underground and underwater distribution systems.

3. Interpret standards and regulations pertaining to underground and underwater distribution systems.

4. Interpret information pertaining to underground and underwater distribution systems found on drawings and specifications.

5. Explain principles of underground and underwater distribution system construction.

6. Identify tools and equipment pertaining to troubleshooting underground and underwater distribution systems and describe their applications and procedures for use.
   i) live-line tools
   ii) temporary grounding system
   iii) potential indicators

iv) rigging tools and equipment
v) test equipment
- TTR
- TDR
- hipot
- megger

7. Identify types of underground and underwater distribution systems and describe their applications.
i) radial
ii) loop
iii) network

8. Identify components and accessories used in underground and underwater distribution systems and describe their characteristics and applications.
i) cables
- concentric neutral
- non-shielded
- shielded
ii) cable protection
iii) system grounds
iv) duct systems
v) direct buried systems
vi) pad-mounted transformers
vii) terminations
viii) splices

9. Identify temporary grounding and bonding requirements pertaining to underground and underwater distribution systems.

10. Describe operating procedures for underground and underwater distribution systems.

11. Describe the procedures used to troubleshoot and test underground and underwater distribution systems, their components and accessories.

12. Describe the procedures used to fish and install cables, their components and accessories.

13. Describe the procedures used to splice cables.

14. Describe the procedures used to cut, strip and terminate cables.

15. Describe the procedures used for temporary grounding and bonding of underground and underwater distribution systems.

Practical Objectives:

N/A

PLT-355 Overhead Distribution Systems Repair II

Learning Outcomes:

- Demonstrate knowledge of overhead distribution systems, their applications and operation.
- Demonstrate knowledge of overhead distribution system construction principles.
- Demonstrate knowledge of the requirements and procedures used in the temporary grounding and bonding of overhead distribution systems.
- Demonstrate knowledge of the procedures used to repair and test overhead distribution system components and accessories.

2019 Red Seal Occupational Standard Reference:

18.03 Repairs overhead distribution systems.

Suggested Hours:

12 Hours

Theoretical Objectives:

1. Define terminology associated with repairing overhead distribution systems.

2. Identify hazards and describe safe work practices pertaining to repairing overhead distribution systems.

3. Interpret codes, standards and regulations pertaining to overhead distribution systems.

4. Interpret information pertaining to overhead distribution systems found on drawings and specifications.

5. Explain the principles of overhead distribution system construction.

6. Identify tools and equipment related to repairing overhead distribution systems and describe their applications and procedures for use.
   - i) live-line tools
   - ii) ladders
   - iii) chainsaws
   - iv) temporary grounding system
   - v) gin poles
   - vi) rubber gloves
   - vii) potential indicators
   - viii) rigging tools and equipment
   - ix) platform boards

7. Identify types of overhead distribution systems and describe their applications.

8. Identify overhead distribution system components and accessories and describe their characteristics and applications.
   i) transformers
   ii) reclosers
   iii) conductors
   iv) system grounds
   v) voltage regulators
   vi) disconnects
   vii) poles
   viii) insulators
   ix) connections
   x) sectionalizers

9. Identify temporary grounding and bonding requirements related to overhead distribution systems.

10. Describe the procedures used for temporary grounding and bonding of overhead distribution systems.

11. Describe the procedures used to repair overhead distribution systems, their components and accessories.

12. Describe the procedures used to test overhead distribution systems, their components and accessories.

13. Describe the operating procedures for overhead distribution systems.

Practical Objectives:

N/A

PTN-360 Underground and Underwater Distribution Systems Repair II

Learning Outcomes:

- Demonstrate knowledge of underground and underwater distribution systems, their characteristics and applications.
- Demonstrate knowledge of underground and underwater distribution system construction principles.
- Demonstrate knowledge of the requirements and procedures used in the temporary grounding and bonding of underground and underwater distribution systems.
- Demonstrate knowledge of the procedures used to repair and test underground and underwater distribution system components and accessories.
- Demonstrate knowledge of the procedures used to fish, install, splice cut, strip and terminate cables.

2019 Red Seal Occupational Standard Reference:

18.04 Repairs underground and underwater distribution systems.

Suggested Hours:

17 Hours

Theoretical Objectives:

1. Define terminology associated with repairing underground and underwater distribution systems.

2. Identify hazards and describe safe work practices pertaining to repairing underground and underwater distribution systems.

3. Interpret codes, standards and regulations pertaining to underground and underwater distribution systems.

4. Interpret information pertaining to underground and underwater distribution systems found on drawings and specifications.

5. Explain the principles of underground and underwater distribution system construction.

6. Identify tools and equipment related to repairing underground and underwater distribution systems and describe their applications and procedures for use.
   i) live-line tools
   ii) temporary grounding system
   iii) potential indicators
   iv) rigging tools and equipment

v) test equipment
   - TTR
   - TDR
   - hipot
   - megger

7. Identify types of underground and underwater distribution systems and describe their characteristics and applications.
   i) radial
   ii) loop
   iii) network

8. Identify underground and underwater distribution system components and accessories and describe their characteristics and applications.
   i) pad-mounted transformers
   ii) cables
      - concentric neutral
      - non-shielded
      - shielded
   iii) cable protection
   iv) system grounds
   v) duct systems
   vi) direct-buried systems

9. Identify temporary grounding and bonding requirements related to underground and underwater distribution systems.

10. Describe the procedures used for temporary grounding and bonding of underground and underwater distribution systems.

11. Describe the procedures used to repair underground and underwater distribution systems, their components and accessories.

12. Describe the procedures used to test underground and underwater distribution systems, their components and accessories.

13. Describe the procedures used to fish and install cables, their components and accessories.

14. Describe the procedures used to splice underground and underwater cables.

15. Describe the procedures used to cut, strip and terminate underground and underwater cables.

16. Describe the operating procedures for underground and underwater distribution systems.

Practical Objectives:

1. Test cables using TDR, hi-pot and megger.

Level 4

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PLT-400 Mentoring

Learning Outcomes:

- Demonstrate knowledge of the strategies for learning skills in the workplace.
- Demonstrate knowledge of the strategies for teaching workplace skills.

2019 Red Seal Occupational Standard Reference:

6.02 Uses mentoring techniques.

Suggested Hours

6 Hours

Theoretical Objectives:

1. Describe the importance of individual experience.

2. Describe the shared responsibilities for workplace learning.

3. Determine one's own learning preferences and explain how these relate to learning new skills.

4. Describe the importance of different types of skills in the workplace.

5. Describe the importance of essential skills in the workplace.
   - i) reading
   - ii) writing
   - iii) document use
   - iv) oral communication
   - v) numeracy
   - vi) thinking
   - vii) working with others
   - viii) digital technology
   - ix) continuous learning

6. Identify different learning styles.
   - i) seeing it
   - ii) hearing it
   - iii) trying it

7. Identify different learning needs and strategies to meet learning needs.
   - i) learning disabilities
   - ii) learning preferences

iii) language proficiency

8. Identify strategies to assist in learning a skill.
   i) understanding the basic principles of instruction
   ii) developing coaching skills
   iii) being mature and patient
   iv) providing feedback

9. Identify different roles played by a workplace mentor.

10. Describe teaching skills.
   i) identifying the point of the lesson
   ii) linking the lesson
   iii) demonstrating the skill
   iv) providing practice
   v) giving feedback
   vi) assessing skills and progress

11. Explain the importance of identifying the point of a lesson.

12. Identify how to choose a good time to present a lesson.

13. Explain the importance of linking the lessons.

14. Identify the components of the skill (the context).

15. Describe considerations in setting up opportunities for skill practice.

16. Explain the importance of providing feedback.

17. Identify techniques for giving effective feedback.

18. Describe a skills assessment.

19. Identify methods of assessing progress.

20. Explain how to adjust a lesson to different situations.

Practical Objectives:

N/A

PLT-405 Live-Lines III

Learning Outcomes:

- Demonstrate knowledge of the principles of live-line work using bare-hand methods.
- Demonstrate knowledge of the procedures used to perform bare-hand methods.

2019 Red Seal Occupational Standard Reference:

5.03 Uses bare-hand method.

Suggested Hours:

3 Hours

Theoretical Objectives:

1. Define terminology associated with live-line work using bare-hand methods.

2. Identify hazards and describe safe work practices related to live-line work using bare-hand methods.

3. Interpret codes, standards and regulations related to live-line work using bare-hand methods.

4. Interpret information related to live-line work using bare-hand methods found on drawings and specifications.

5. Identify tools and equipment used for live-line work using bare-hand methods and describe their applications and procedures for use.
   i) insulated aerial device
   ii) metal grids
   iii) current leakage meter
   iv) insulated ladder
   v) FRP tool (hot stick)

6. Identify types of live-line work using bare-hand methods and describe their applications.

7. Identify line protection requirements related to live-line work using bare-hand methods.

8. Describe principles of live-line work using bare-hand methods.

9. Describe the procedures used to perform bare-hand methods.

10. Interpret information and perform calculations related to live-line rigging using bare-hand methods.
    i) weights and tensions
    ii) WLL
    iii) SWL
    iv) current leakage test

Practical Objectives:

N/A

PLT-410 Transmission Tension Method

Learning Outcomes:

- Demonstrate knowledge of the procedures used to string distribution lines.
- Demonstrate knowledge of transmission lines, their applications and operation.
- Demonstrate knowledge of the procedures used in the temporary grounding and bonding of transmission lines.

2019 Red Seal Occupational Standard Reference:

9.01 Strings overhead conductors and cables.
9.02 Sags overhead conductors and cables.
9.03 Ties-in overhead conductors and cables.
9.04 Installs splices and connections to overhead conductors and cables.

Suggested Hours:

6 Hours

Theoretical Objectives:

1. Define terminology associated with transmission lines.

2. Identify hazards and describe safe work practices related to transmission lines.

3. Interpret codes, standards and regulations related to transmission lines.

4. Interpret information related to transmission lines found on drawings and specifications.

5. Identify tools and equipment related to transmission lines and describe their applications and procedures for use.
   i) pulling equipment
   ii) tension stringing equipment
   iii) grounding equipment
   iv) cover-up

6. Identify types of transmission lines and describe their characteristics and applications.

7. Identify transmission line components and describe their applications and operation.

8. Identify temporary grounding and bonding procedures related to transmission lines.

9. Identify basic electrical design requirements of transmission lines.

10. Describe the procedures used to install transmission lines.

11. Describe the procedures used to sag overhead conductors and cables using the transmission tension stringing method.

12. Describe the procedures used to tie-in overhead conductors and cables using the transmission tension stringing method.

13. Describe the procedures used to install splices and connections to overhead conductors and cables using the transmission tension stringing method.

14. Describe the procedures used for temporary grounding and bonding of transmission lines.

Practical Objectives:

N/A

PLT-415 Power Transformers

Learning Outcomes:

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

2019 Red Seal Occupational Standard Reference:

12.01 Installs transformers.

Suggested Hours:

12 Hours

Theoretical Objectives:

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. Explain power transformer operating principles and their applications.

6. Explain transformer protection principles and their applications related to power transformers.

7. Identify tools and equipment related to power transformers and describe their applications and procedures for use.

8. Identify types of power transformers and describe their applications.
   i) stationary
   ii) mobile

9. Identify types of power transformer connections and describe their applications.
   i) two-winding
   ii) autotransformer
   iii) tertiary

10. Identify power transformer components and describe their functions.
    i) core
    ii) windings
    iii) oil
    iv) bushings
    v) gaskets
    vi) tank
    vii) cover
    viii) taps and tap changer
    ix) mounting brackets
    x) switches
    xi) cooling systems
    xii) protection alarms

11. Describe power transformer wiring configurations.

12. Describe the procedures used to install power transformers.

13. Describe the procedures used for paralleling power transformers.

Practical Objectives:

N/A

PTN-420 Voltage Control Equipment II

Learning Outcomes:

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

2019 Red Seal Occupational Standard Reference:

5.04 Uses fibreglass reinforced plactoc (FRP) tools (hot sticks)
12.02 Installs capacitors.
12.03 Installs voltage regulators.
12.05 Installs reactors.

Suggested Hours:

23 Hours

Theoretical Objectives:

1. Define terminology associated with voltage control equipment.
   i) capacitors
   ii) voltage regulation and control devices
   iii) reactors

2. Identify hazards and describe safe work practices related to voltage storage equipment.
   i) capacitors
   ii) voltage regulation and control devices
   iii) reactors

3. Interpret codes, standards and regulations related to voltage control equipment.
   i) capacitors
   ii) voltage regulations and control devices
   iii) reactors

4. Interpret information related to voltage control equipment found on drawings and specifications.
   i) capacitors
   ii) voltage regulation and control devices
   iii) reactors

5. Explain concepts related to voltage control equipment.
   i) operating principles of reactors
   ii) reactors and their applications related to line protection
   iii) reactor coordination

6. Identify tools and equipment related to voltage equipment and describe their applications and procedures for use.
   i) capacitors
      - drills
      - AWP
      - FRP tools (hot sticks)
      - multi-meters
   ii) voltage regulation and control devices
      - AWP
      - Drills
      - compression tools
      - FRP tools (hot sticks)
      - multi-meter
      - neutral detector
   iii) reactors
      - drills
      - compression tools
      - FRP tools (hot sticks)

7. Identify types of capacitors and describe their characteristics and applications.
   i) shunt connection
   ii) series connection
   iii) series-parallel

8. Identify types of reactors and describe their characteristics and applications.

9. Identify capacitor components and accessories and describe their characteristics and applications.
   i) dielectric insulation
   ii) plates
   iii) case
   iv) bushings

10. Identify reactor components and describe their characteristics and applications.

11. Identify voltage regulation and control devices and accessories and describe their characteristics and applications.
    i) bridging reactor
    ii) voltage regulators
    iii) auto boosters

12. Identify the considerations and requirements for selecting capacitors, voltage regulation control devices, reactors and their accessories.

13. Describe the procedures related to voltage control equipment, their components and accessories.
    i) capacitors
        - install and operate capacitors
        - protect capacitors
        - inspect and test capacitors
    ii) voltage regulation and control devices
        - install and operate
        - switch voltage regulation and control devices in and out of service
    iii) reactors
        - install and operate reactors
        - troubleshoot reactors
        - inspect reactors

14. Describe the operating principles of voltage control equipment.
    i) capacitors
    ii) voltage regulation and control devices
    iii) reactors

15. Describe commissioning requirements for capacitor controls.

16. Describe commissioning and decommissioning requirements for voltage regulation and control devices.

Practical Objectives:

1. Install capacitors in parallel and series connection.

2. Use proper procedures to remove capacitors from service.

PLT-425 Cellular Antennas

Learning Outcomes:

- Demonstrate knowledge of cellular antenna operating principles.
- Demonstrate knowledge of the procedures used to install cellular antennas.

2019 Red Seal Occupational Standard Reference:

15.01 Installs cellular antennas.

Suggested Hours:

3 Hours

Theoretical Objectives:

1. Define terminology associated with cellular antennas.

2. Identify hazards and describe safe work practices pertaining to cellular antennas.
   i) devices with hazardous fields
   ii) disconnect points

3. Interpret standards and regulations pertaining to cellular antennas.

4. Identify tools and equipment related to cellular antennas and describe their applications and procedures for use.
   i) drills
   ii) wrenches
   iii) rigging equipment

5. Identify types of cellular antennas and describe their applications.

6. Describe the procedures used to install cellular antennas.

Practical Objectives:

N/A

PTN-430 Station Switching

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.
- Demonstrate knowledge of the operating procedures for overhead, underground and underwater distribution systems, their components and accessories.
- Demonstrate knowledge of the operating procedures for overhead, underground and underwater transmission systems, their components and accessories.

2019 Red Seal Occupational Standard Reference:

16.01 Operates transmission systems.
16.02 Operates distribution systems.
16.03 Performs station switching.

Suggested Hours:

60 Hours

Theoretical Objectives:

1. Define terminology associated with distribution and transmission systems.
   i) operation
   ii) switching station
   iii) substations
   iv) terminals

2. Identify hazards and describe safe work practices pertaining to distribution and transmission systems.
   i) operation
   ii) switching station
   iii) substations
   iv) terminals

3. Interpret codes, standards and regulations pertaining to distribution and transmission systems.
   i) operation
   ii) switching station
   iii) substations
   iv) terminals

4. Interpret information pertaining to distribution and transmission systems found on drawings and specifications.
   i) operation
   ii) switching station
   iii) substations
   iv) terminals

5. Identify tools and equipment related to substations, switching stations and terminals and describe their applications and procedures for use.
   i) rubber gloves
   ii) load break tools
   iii) FRP tools (hot sticks)
   iv) temporary grounding system
   v) voltage indicators

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.
   i) metal clad switchgear
   ii) breakers
      - main
      - feeder
   iii) station service
   iv) recloser
   v) potential transformers
   vi) current transformers
   vii) battery bank

8. Identify underground and underwater components and accessories used in distribution systems and describe their characteristics and applications.

9. Identify types of overhead, underground and underwater transmission systems and describe their characteristics and applications.

10. Identify overhead, underground and underwater transmission system components and accessories, and describe their applications and operation.

11. Describe the procedures used to inspect and maintain substations, their components and accessories.

12. Describe the procedures used to inspect and maintain switching stations, their components and accessories.

13. Describe the procedures used to inspect and maintain terminals, their components and accessories.

14. Describe the procedures used to operate overhead, underground and underwater distribution systems, their components and accessories.

15. Describe the procedures used to operate overhead, underground and underwater transmission systems, their components and accessories.

16. Identify overhead components and accessories used in distribution systems and describe their characteristics and applications.
    i) transformers
    ii) disconnects
    iii) conductors
    iv) poles
    v) insulators
    vi) reclosers

Practical Objectives:

1. Perform switching procedures, create switching orders and apply lock out / tag out procedures as required.

PTN-435 Distribution and Transmission Systems Maintenance III

Learning Outcomes:

- Demonstrate knowledge of the procedures used to inspect, maintain and operate overhead, underground and underwater distribution and transmission systems.
- Demonstrate knowledge of system components, their operation, characteristics and applications.
- Demonstrate knowledge of the procedures used to inspect and maintain system components.
- Demonstrate knowledge of transformers and power transformers, their components, applications and operation.
- Demonstrate knowledge of the procedures used to inspect and maintain protective devices.
- Demonstrate knowledge of the procedures used to inspect, maintain and test line capacitors, their components and accessories.

2019 Red Seal Occupational Standard Reference:

17.01 Inspects distribution and transmission systems.
17.04 Maintains system components.

Suggested Hours:

30 Hour

Theoretical Objectives:

1. Define terminology associated with the maintenance of distribution and transmission systems.

2. Identify hazards and describe safe work practices pertaining to the maintenance of distribution and transmission systems.

3. Interpret codes, standards and regulations pertaining to the maintenance of distribution and transmission systems.

4. Interpret information pertaining to distribution and transmission systems found on nameplates, drawings and specifications.

5. Explain system component operating principles and their applications.

6. Explain power transformer fusing principles and their applications.

7. Identify tools and equipment pertaining to the maintenance of distribution and transmission systems and describe their applications and procedures for use.
   i) system components
      - rubber gloves
      - test equipment
      - live-line tools
      - hand tools
      - rigging tools and equipment

8. Identify types of distribution and transmission systems and describe their characteristics and applications.
   i) underground and underwater
      - radial
      - loop
      - network
   ii) overhead
      - radial
      - loop
      - network

9. Identify types of system components and describe their characteristics, applications and accessories.
   i) voltage regulation and control devices
   ii) line protective devices
   iii) line capacitors
   iv) switching stations and terminal

10. Identify types of power transformer connections and describe their applications.
   i) two-winding
   ii) autotransformer
   iii) tertiary

11. Identify distribution and transmission system components and describe their applications and operation.
   i) power transformers
   ii) capacitors

12. Identify power 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

13. Describe the procedures used to inspect and maintain overhead, underground and underwater distribution systems, their components and accessories.

14. Describe the procedures used to inspect and maintain overhead, underground and underwater transmission systems, their components and accessories.

15. Describe the procedures used to inspect and maintain system components.

16. Describe the procedures used to inspect and maintain protective devices, their components and accessories.
    i) air break devices
        - load breaking
        - non-load breaking
    ii) fuses
    iii) power fuses
    iv) oil devices
    v) vacuum devices
    vi) de-ionizing gas devices
        - SF_6
        - circuit breaker
    vii) lightning arrestors
    viii) current limiting fuses

17. Describe the procedures used to inspect, maintain and test line capacitors, their components and accessories.

Practical Objectives:

1. Change an insulator on a transmission structure.

PTN-440 Steel Lattice Structures II

Learning Outcomes:

- Demonstrate knowledge of steel lattice structures, their characteristics and applications.
- Demonstrate knowledge of the procedures used to inspect and maintain steel lattice structures, their components and accessories.

2019 Red Seal Occupational Standard Reference:

17.03 Maintains steel lattice structures.

Suggested Hours:

9 Hours

Theoretical Objectives:

1. Define terminology associated with the maintenance of steel lattice structure.

2. Identify hazards and describe safe work practices pertaining to the maintenance of steel lattice structures.

3. Interpret codes, standards and regulations pertaining to the maintenance of steel lattice structures.

4. Interpret information pertaining to steel lattice structures found on nameplates, drawings and specifications.

5. Identify tools and equipment pertaining to the maintenance of steel lattice structures and describe their applications and procedures for use.
   i) torque wrench
   ii) spud wrench
   iii) drift pins
   iv) AWP

6. Identify types of steel lattice structures and describe their characteristics and applications.
   i) H-frame
   ii) H-frame with overhead ground wire
   iii) steel tower
   iv) single pole

7. Identify steel lattice structure components and accessories.

8. Describe the procedures used to inspect and maintain steel lattice structures.

9. Describe the procedures used to inspect and maintain steel lattice structure components and accessories.

Practical Objectives:

1. Perfom climbing techniques utilizing fall protection equipment on lattice structures.

PLT-445 Overhead Transmission Systems Troubleshooting

Learning Outcomes:

- Demonstrate knowledge of overhead transmission systems, their applications and operation.
- Demonstrate knowledge of overhead transmission system construction principles.
- Demonstrate knowledge of the procedures used to troubleshoot and test overhead transmission systems, and their components and accessories.
- Demonstrate knowledge of the procedures used in temporary grounding and bonding of overhead distribution systems.

2019 Red Seal Occupational Standard Reference:

19.01 Troubleshoots overhead transmission systems.

Suggested Hours

6 Hours

Theoretical Objectives:

1. Define terminology associated with troubleshooting overhead transmission systems.

2. Identify hazards and describe safe work practices pertaining to troubleshooting overhead transmission systems.

3. Interpret standards and regulations pertaining to overhead transmission systems.

4. Interpret information pertaining to overhead transmission systems found on drawings and specifications.

5. Explain principles of overhead transmission system construction.

6. Identify tools and equipment pertaining to troubleshooting overhead transmission systems and describe their applications and procedures for use.

7. Identify types of overhead transmission systems and describe their applications.

8. Identify components and accessories used in overhead transmission systems and describe their characteristics and applications.
   i) insulators
   ii) cross arms
   iii) dapers
   iv) conductors

v) armour rods
vi) poles and towers

9. Identify temporary grounding and bonding requirements pertaining to overhead transmission systems.

10. Describe the procedures used to troubleshoot overhead transmission systems, their components and accessories.

11. Describe the procedures used to test overhead transmission systems, their components and accessories.

12. Describe the procedures used for temporary grounding and bonding of overhead transmission systems.

Practical Objectives:

N/A

PTN-450 Underground and Underwater Transmission Systems Troubleshooting

Learning Outcomes:

- Demonstrate knowledge of underground and underwater transmission systems, their applications and operation.
- Demonstrate knowledge of underground and underwater transmission system construction principles.
- Demonstrate knowledge of the procedures used to troubleshoot and test underground and underwater transmission systems, their components and accessories.
- Demonstrate knowledge of the procedures used to fish, install, splice, cut, strip and terminate cables.
- Demonstrate knowledge of the procedures used in temporary grounding and bonding of underground and underwater transmission systems.

2019 Red Seal Occupational Standard Reference:

19.02 Troubleshoots underground and underwater transmission systems.

Suggested Hours:

16 Hours

Theoretical Objectives:

1. Define terminology associated with troubleshooting underground and underwater transmission systems.

2. Identify hazards and describe safe work practices pertaining to troubleshooting underground and underwater transmission systems.

3. Interpret codes, standards and regulations pertaining to underground and underwater transmission systems.

4. Interpret information pertaining to underground and underwater transmission systems found on drawings and specifications.

5. Explain the principles of underground and underwater transmission system construction.

6. Identify tools and equipment pertaining to troubleshooting underground and underwater transmission systems and describe their applications and procedures for use.

7. Identify types of underground and underwater transmission systems and describe their applications.

8. Identify components and accessories used in underground and underwater transmission systems and describe their characteristics and applications.
   i) cables
      - armoured
      - shielded
   ii) cable protection
   iii) system grounds
   iv) duct systems
   v) direct buried systems
   vi) terminations
   vii) splices

9. Identify temporary grounding and bonding requirements pertaining to underground and underwater transmission systems.

10. Describe the procedures used to troubleshoot underground and underwater transmission systems, their components and accessories.

11. Describe the procedures used to test underground and underwater transmission systems, their components and accessories.

12. Describe the procedures used to fish and install cables, their components and accessories.

13. Describe the procedures used to splice cables.

14. Describe the procedures used to cut, strip and terminate cables.

15. Describe the procedures used for temporary grounding and bonding of underground and underwater transmission systems.

Practical Objectives:

1. Perform a cable splice and termination.

PTN-455 Overhead Transmission Systems Repair II

Learning Outcomes:

- Demonstrate knowledge of repairing overhead transmission systems, their applications and operation.
- Demonstrate knowledge of overhead transmission system construction principles.
- Demonstrate knowledge of the requirements and procedures used in the temporary grounding and bonding of overhead transmission systems.
- Demonstrate knowledge of the procedures used to repair and test overhead transmission system components and accessories.

2019 Red Seal Occupational Standard Reference:

19.03 Repairs overhead transmission systems.

Suggested Hours:

18 Hours

Theoretical Objectives:

1. Define terminology associated with repairing overhead transmission systems.

2. Identify hazards and describe safe work practices pertaining to repairing overhead transmission systems.

3. Interpret codes, standards and regulations pertaining to overhead transmission systems.

4. Interpret information pertaining to overhead transmission systems found on drawings and specifications.

5. Explain the principles of overhead transmission system construction.

6. Identify tools and equipment related to repairing overhead transmission systems and describe their applications and procedures for use.
   - i) live-line tools
   - ii) ladders
   - iii) chainsaws
   - iv) temporary grounding system
   - v) gin poles
   - vi) rubber gloves
   - vii) potential indicators
   - viii) rigging tools and equipment
   - ix) platform boards

7. Identify types of overhead transmission systems and describe their characteristics and applications.

8. Identify overhead transmission system components and describe their characteristics and applications.
   i) crossarm
   ii) timbers
   iii) conductors
   iv) poles and towers
   v) insulators
   vi) dampers
   vii) spacers

9. Identify temporary grounding and bonding requirements related to overhead transmission systems.

10. Describe the procedures used for temporary grounding and bonding of overhead transmission systems.

11. Describe the procedures used to repair overhead transmission systems, their components and accessories.

12. Describe the procedures used to test overhead transmission systems, their components and accessories.

Practical Objectives:

1. Replace a cross-arm on a transmission structure.

PTN-460 Underground and Underwater Transmission Systems Repair II

Learning Outcomes:

- Demonstrate knowledge of underground and underwater transmission systems, their characteristics and applications.
- Demonstrate knowledge of underground and underwater transmission system construction principles.
- Demonstrate knowledge of the procedures used in the temporary grounding and bonding of underground and underwater transmission systems.
- Demonstrate knowledge of the procedures used to repair and test underground and underwater transmission system components and accessories.
- Demonstrate knowledge of the procedures used to fish, install, splice cut, strip and terminate cables.

2019 Red Seal Occupational Standard Reference:

19.04 Repairs underground and underwater transmission systems.

Suggested Hours

18 Hours

Theoretical Objectives:

1. Define terminology associated with repairing underground and underwater transmission systems.

2. Identify hazards and describe safe work practices pertaining to repairing underground and underwater transmission systems.

3. Interpret codes, standards and regulations pertaining to underground and underwater transmission systems.

4. Interpret information pertaining to underground and underwater transmission systems found on drawings and specifications.

5. Explain the principles of underground and underwater transmission system construction.

6. Identify tools and equipment related to repairing underground and underwater transmission systems and describe their applications and procedures for use.
   i) live-line tools
   ii) temporary grounding system
   iii) potential indicators

iv) rigging tools and equipment

7. Identify types of underground and underwater transmission systems and describe their characteristics and applications.

8. Identify components used in repairing underground and underwater transmission systems and describe their characteristics and applications.
   i) cables
      - armoured
      - shielded
   ii) cable protection
   iii) system grounds
   iv) duct systems
   v) direct-buried systems
   vi) terminations
   vii) splices

9. Identify temporary grounding and bonding requirements related to underground and underwater transmission systems.

10. Describe the procedures used for temporary grounding and bonding of underground and underwater transmission systems.

11. Describe the procedures used to repair underground and underwater transmission systems, their components and accessories.

12. Describe the procedures used to test underground and underwater transmission systems, their components and accessories.

13. Describe the procedures used to fish and install cables, their components and accessories.

14. Describe the procedures used to splice underground and underwater transmission cables.

15. Describe the procedures used to cut, strip and terminate underground and underwater transmission cables.

Practical Objectives:

1. Perform switching and temporary grounding on underground cables.

PLT-465 Program Review

Learning Outcomes:

- Demonstrate knowledge of the Red Seal Occupational Standard (RSOS) and its relationship to the Interprovincial Examination.
- Demonstrate knowledge of overall comprehension of the trade in preparation for the Interprovincial Examination.

2019 Red Seal Occupational Standard Reference:

Entire Red Seal Occupational Standard (RSOS).

Suggested Hours

30 Hours

Theoretical Objectives:

1. Define terminology associated with an RSOS.
   i) Major Work Activity
   ii) levels
   iii) tasks
   iv) sub-tasks

2. Explain how an RSOS is developed and the link it has with the Interprovincial Red Seal Examination.
   i) development
   ii) validation
   iii) level and task weighting
   iv) examination breakdown
      - pie-chart

3. Identify Red Seal products and describe their use for preparing for the Interprovincial Red Seal Examination.
   i) Red Seal website
   ii) examination preparation guide
   iii) sample questions
   iv) examination counselling sheets

4. Explain the relationship between the RSOS and the AACS.

5. Review common occupational skills for the Powerline Technician trade as identified in the RSOS.
   i) performs safety related functions

ii) uses and maintains tools and equipment
iii) organizes work
iv) accesses work area
v) uses live-line methods
vi) uses communication and mentoring techniques

6. Review process to install structures for the Powerline Technician trade as identified in the RSOS.
   i) installs pole structures
   ii) installs steel lattice structures

7. Review process to install conductor systems for the Powerline Technician trade as identified in the RSOS.
   i) installs overhead conductors and cables
   ii) installs underground and underwater cables

8. Review process to install auxiliary equipment for the Powerline Technician trade as identified in the RSOS.
   i) installs lighting systems
   ii) installs voltage control equipment
   iii) installs protection equipment
   iv) installs metering equipment
   v) installs communication devices

9. Review process to perform operation, maintenance, and repair of systems for the Powerline Technician trade as identified in the RSOS.
   i) operates distribution and transmission systems
   ii) maintains distribution and transmission systems
   iii) repairs distribution systems
   iv) repairs transmission systems

Practical Objectives:

N/A

Feedback and Revisions

This AACS will be amended periodically; comments or suggestions for improvements should be directed to:

New Brunswick:
Apprenticeship and Occupational Certification
Post-Secondary Education, Training and Labour
470 York St., Rm. 110, PO Box 6000
Fredericton, NB E3B 5H1
Tel: 506-453-2260
Toll Free in NB: 1-855-453-2260
www.gnb.ca

Prince Edward Island:
Apprenticeship, Training and Certification
Atlantic Technology Centre
212-176 Great George St., PO Box 2000
Charlottetown, PE C1A 7N8
Tel: 902-368-4460
www.apprenticeship.pe.ca

Newfoundland and Labrador:
Apprenticeship and Trades Certification
Jobs, Immigration and Growth
Confederation Bldg., West Block
100 Prince Philip Dr., PO Box 8700
St. John's, NL A1B 4J6
Toll Free: 1-877-771-3737
www.gov.nl.ca/atcd

Nova Scotia:
Nova Scotia Apprenticeship Agency
1256 Barrington St.
Halifax, NS B3J 1Y6
Tel: 902-424-5651
Toll Free in NS: 1-800-494-5651
www.nsapprenticeship.ca

Any comments or suggestions received will be reviewed and considered to determine the course of action required. If the changes are deemed to be minor, they will be held for implementation during the next review cycle. If immediate change is deemed appropriate and approved by the Atlantic Trade Advisory Committee, it will result in a revision to this version of the AACS and will be detailed in the following section.

Version Changes

Revision Date	Section	Description of Change