SKILLED TRADES BC

PROGRAM OUTLINE

Powerline Technician

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POWERLINE TECHNICIAN
HARMONIZED PROGRAM OUTLINE

APPROVED BY INDUSTRY

DECEMBER 2019

BASED ON

RSOS 2019

Developed by
SkilledTradesBC
Province of British Columbia

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Section 1

INTRODUCTION

Powerline Technician

Foreword

This revised Powerline Technician Program Outline is intended as a guide for instructors, apprentices, and employers of apprentices as well as for the use of industry organizations, regulatory bodies, and provincial and federal governments. It reflects updated standards based on the new Powerline Technician Red Seal Occupational Standard (2019) and was prepared with the participation, advice and assistance of British Columbia industry and instructor subject matter experts and will form the basis for further updating of the British Columbia Powerline Technician Program.

Practical instruction by demonstration and student participation should be integrated with classroom sessions. Safe working practices, even though not always specified in each operation or topic, are an implied part of the program and should be stressed throughout the apprenticeship.

This Program Outline includes a list of recommended references that are available to support the learning objectives and the minimum shop requirements needed to support instruction.

Competencies are to be evaluated through written exams and practical assessments. A passing grade is achieved by getting an overall mark of 70%. See the Assessment Guidelines for more details. The types of questions used on these exams must reflect the cognitive level indicated by the learning objectives and the learning tasks listed in the related competencies.

Achievement Criteria are included for those competencies that require a practical component. The intent of including Achievement Criteria in the Program Outline is to ensure consistency in training across the many training institutions in British Columbia. Their purpose is to reinforce the theory and to provide a mechanism for evaluation of the learner's ability to apply the theory to practice. It is important that these performances be observable and measurable and that they reflect the skills spelled out in the competency as those required of a competent journeyperson. The conditions under which these performances will be observed and measured must be clear to the learner as well as the criteria by which the learner will be evaluated. The learner must also be given the evaluation criteria.

The performance spelled out in the Achievement Criteria is a suggested performance and is not meant to stifle flexibility of delivery. Training providers are welcome to substitute other practical performances that measure similar skills and attainment of the competency. Multiple performances may also be used to replace individual performances where appropriate.

SAFETY ADVISORY

Be advised that references to the WorkSafeBC safety regulations contained within these materials do not/may not reflect the most recent Occupational Health and Safety Regulation the current Standards and Regulation in BC can be obtained on the following website: http://www.worksafebc.com. Please note that it is always the responsibility of any person using these materials to inform him/herself about the Occupational Health and Safety Regulation pertaining to his/her work.

Acknowledgements

The Subject Matter Experts (SMEs) retained to review the Program Outline in 2019 include:

- Ben Berkelaar, BC Hydro
- Wesley Nustad, BC Hydro
- Chris Smith, BC Hydro
- Chase Anderson, Allteck Line Contractors
- Dave Fossa, Allteck Line Contractors
- Benton Hadley, Fortis BC
- Pat Hagel, IBEW 258

The industry Subject Matter Experts (SMEs) retained to review the Program Outline in 2013/2014 include:

- Ben Berkelaar, BC Hydro
- Gerry Bramhill, Electrical Industry Training Institute
- Phil Davis, Electrical Industry Training Institute
- Mike Ferguson, BC Hydro
- Dan Giesbrecht, IBEW 258
- Benton Hadley, Fortis BC
- Allan Pineau, BC Hydro
- Jeff Skosnik, Line Contractors Association

SkilledTradesBC would like to acknowledge the dedication and hard work of all the industry representatives appointed to identify the training requirements of the Powerline Technician occupation.

How to Use this Document

This Program Outline has been developed for the use of individuals from several different audiences. The table below describes how each section can be used by each intended audience.

Section	Training Providers	Employers/ Sponsors	Apprentices	Challengers
Program Credentialing Model	Communicates program length and structure, and all pathways to completion	Illustrates the length and structure of the program	Illustrates the length and structure of the program, and pathway to completion	Illustrates the challenger pathway to Certificate of Qualification
OAC	Communicates the competencies that industry has defined as representing the scope of the occupation	Displays the competencies that an apprentice is expected to demonstrate in order to achieve certification	Displays the competencies apprentices will achieve as a result of program completion	Displays the competencies challengers must demonstrate in order to challenge the program
Training Topics and Suggested Time Allocation	Shows proportionate representation of general areas of competency (GACs) at each program level, the suggested proportion of time spent on each GAC, and percentage of time spent on theory versus practical application	Shows the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application	Shows the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application	Shows the relative weightings of various competencies of the occupation on which assessment is based
Program Content	Defines the objectives, learning tasks, and high level content for each competency, as well as defining observable, measurable achievement criteria for objectives with a practical component	Identifies detailed program content and performance expectations for competencies with a practical component; may be used as a checklist prior to signing a recommendation for certification (RFC) for an apprentice	Provides detailed information on program content and performance expectations for demonstrating competency	Allows individual to check program content areas against their own knowledge and performance expectations against their own skill levels
Training Provider Standards	Defines the facility requirements, tools and equipment, reference materials (if any) and instructor requirements for the program	Identifies the tools and equipment an apprentice is expected to have access to; which are supplied by the training provider and which the student is expected to own	Provides information on the training facility, tools and equipment provided by the school and the student, reference materials they may be expected to acquire, and minimum qualification levels of program instructors	Identifies the tools and equipment a tradesperson is expected to be competent in using or operating; which may be used or provided in a practical assessment

Section	Training Providers	Employers/ Sponsors	Apprentices	Challengers
Appendix – Glossary of Acronyms			Defines program specific acronyms	

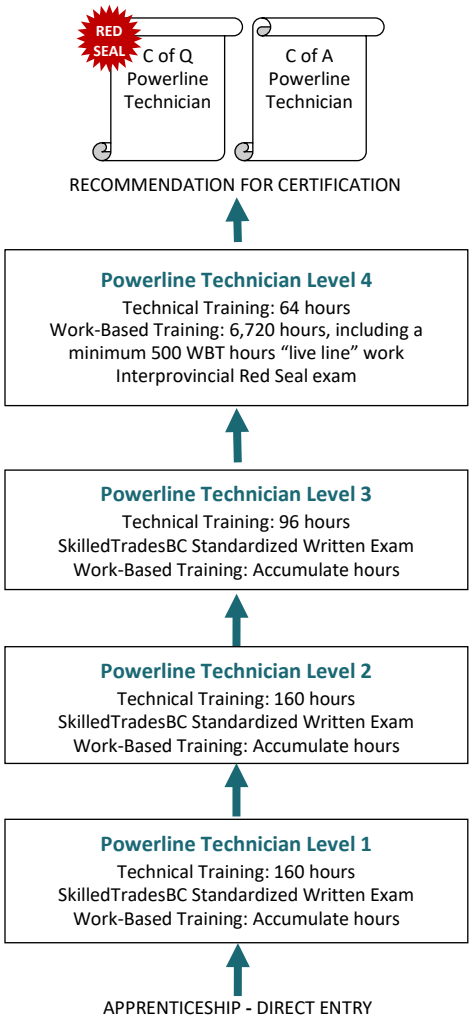
Section 2

PROGRAM OVERVIEW

Powerline Technician

Program Credentialing Model

C of Q = Certificate of Qualification
C of A = Certificate of Apprenticeship



CROSS-PROGRAM CREDITS
Individuals who hold the credentials listed below are entitled to receive partial credit toward the completion requirements of this program

- NONE

Occupational Analysis Chart

POWERLINE TECHNICIAN

Occupation Description: Powerline technicians install, maintain and repair overhead, underground and underwater powerlines and cables, and other associated equipment such as insulators, conductors, lightning arrestors, switches, metering systems, transformers and lighting infrastructure.

Line (GAC)	Task	W	Code					
SAFETY AND SAFE WORK PRACTICES (A)	Apply safety regulations	W	A1	1				
	Use trade specific personal protective equipment (PPE)	W	A2	1				
	Apply limits of approach	W	A3	1				
	Apply lock-out and tag-out procedures	W	A4	1				
	Apply grounding and equi-potential bonding principles	W	A5	1				
	Perform rescue	W	A6	1				
CLIMBING (B)	Describe care and use of climbing equipment	W	B1	1				
	Climb structures	W	B2	1				
	Use elevated platforms and ladders	W	B3	1				
	Test for pole (structure) stability	W	B4	1				
POLICIES AND REGULATIONS (C)	Identify environmental hazards	W	C1	1				
	Apply industry safety regulations	W	C2	1				
TOOLS AND INSTRUMENTS (D)	Use hand tools	W	D1	1				
	Use power tools	W	D2	1				
	Use live line tools	W	D3	1				
	Use test instruments	W	D4	1	2			
ELECTRICAL THEORY (E)	Apply electrical fundamentals		E1	1	2			
	Describe operation of motors and generators		E2		2			
	Explain transformation and install transformers	W	E3	1	2			
	Install self-contained metering		E4	1				
	Install transformer metering	W	E5			3		
	Describe system operation and protection		E6				4	

W = Workplace Skill Acquisition

	Perform system switching W E7				
				4	
	Operate voltage regulators and capacitors W E8				
				4	

EQUIPMENT **F**	Identify mobile line equipment F1				
	1				
	Use hydraulically-equipped vehicles W F2				
	1				
	Use stringing equipment W F3				
			3	4	

RIGGING **G**	Explain rigging, hoisting and lifting equipment W G1					Use lifting, rigging and hoisting equipment W G2					Use rigging tools and equipment in construction and maintenance W G3					Apply rigging tools and equipment for live line distribution G4					Use rigging tools and equipment in transmission, construction and maintenance W G5					Perform live line transmission rigging W G6				
	1					1						2					2							3					3			

OVERHEAD DISTRIBUTION (OD) **H**	Describe overhead distribution materials H1					Describe overhead distribution systems W H2					Construct distribution lines W H3					Demonstrate safe work practices for live line work H4					Maintain single-phase distribution lines W H5					Maintain three-phase distribution lines W H6				
	1					1					1	2				1					1						2		4	
	Operate overhead distribution (OD) electrical apparatus W H7					Troubleshoot overhead distribution system components W H8																									
		2		4					4																						

UNDERGROUND DISTRIBUTION (UD) **I**	Use underground distribution (UD) equipment and materials I1					Construct underground distribution systems W I2					Maintain underground distribution systems W I3					Operate underground distribution electrical apparatus W I4					Troubleshoot underground distribution system components W I5									
	1	2					2					2						3							4					

TRANSMISSION J	Describe transmission materials J1	Construct transmission lines W J2	Maintain transmission lines W J3	Operate transmission electrical apparatus W J4	Troubleshoot overhead transmission system components W J5
	3	3	3 4	3	4

COMMUNICATION K	Plan tailboard meetings W K1	Communicate using hand signals W K2	Communicate using electronic devices and systems W K3	Apply communication protocols and requirements W K4	Apply communication techniques K5	Apply mentoring techniques K6
	1 2 3	1	1	2	1	4

Training Topics and Suggested Time Allocation

POWERLINE TECHNICIAN – LEVEL 1

			% of Time Allocated to:		
		% of Time	Theory	Practical	Total
Line A	**SAFETY AND SAFE WORK PRACTICES**	**15%**	**60%**	**40%**	**100%**
A1	Apply safety regulations		✓		
A2	Use trade specific personal protective equipment (PPE)		✓	✓	
A3	Apply limits of approach		✓	✓	
A4	Apply lock-out and tag-out procedures		✓	✓	
A5	Apply grounding and equi-potential bonding principles		✓	✓	
A6	Perform rescue		✓	✓	
Line B	**CLIMBING**	**11%**	**40%**	**60%**	**100%**
B1	Describe care and use of climbing equipment		✓		
B2	Climb structures		✓	✓	
B3	Use elevated platforms and ladders		✓	✓	
B4	Test for pole (structure) stability		✓		
Line C	**POLICIES AND REGULATIONS**	**6%**	**60%**	**40%**	**100%**
C1	Identify environmental hazards		✓	✓	
C2	Apply industry safety regulations		✓	✓	
Line D	**TOOLS AND INSTRUMENTS**	**9%**	**45%**	**55%**	**100%**
D1	Use hand tools		✓	✓	
D2	Use power tools		✓	✓	
D3	Use live line tools		✓	✓	
D4	Use test instruments		✓	✓	
Line E	**ELECTRICAL THEORY**	**14%**	**66%**	**34%**	**100%**
E1	Apply electrical fundamentals		✓	✓	
E3	Explain transformation and install transformers		✓	✓	
E4	Install self-contained metering		✓	✓	
Line F	**EQUIPMENT**	**8%**	**34%**	**66%**	**100%**
F1	Identify mobile line equipment		✓		
F2	Use hydraulically-equipped vehicles		✓	✓	
Line G	**RIGGING**	**13%**	**50%**	**50%**	**100%**
G1	Explain rigging, hoisting and lifting equipment		✓		
G2	Use lifting, rigging and hoisting equipment		✓	✓	
Line H	**OVERHEAD DISTRIBUTION (OD)**	**15%**	**55%**	**45%**	**100%**
H1	Describe overhead distribution materials		✓		
H2	Describe overhead distribution systems		✓		
H3	Construct distribution lines		✓	✓	
H4	Demonstrate safe work practices for live line work		✓		
H5	Maintain single-phase distribution lines		✓	✓	
Line I	**UNDERGROUND DISTRIBUTION (UD)**	**4%**	**45%**	**55%**	**100%**

			% of Time Allocated to:		
		% of Time	Theory	Practical	Total
I1	Use Underground distribution (UD) equipment and materials		✓	✓	
Line K	**COMMUNICATION**	**5%**	**50%**	**50%**	**100%**
K1	Plan tailboard meetings		✓	✓	
K2	Communicate using hand signals		✓	✓	
K3	Communicate using electronic devices and systems		✓	✓	
K5	Apply communication techniques		✓		
	Total Percentage for BC Powerline Technician Level One	**100%**			

Training Topics and Suggested Time Allocation

POWERLINE TECHNICIAN – LEVEL 2

			% of Time Allocated to:		
		% of Time	Theory	Practical	Total
Line D	**TOOLS AND INSTRUMENTS**	**13%**	**50%**	**50%**	**100%**
D4	Use test instruments		✓	✓	
Line E	**ELECTRICAL THEORY**	**20%**	**80%**	**20%**	**100%**
E1	Apply electrical fundamentals		✓	✓	
E2	Describe operation of motors and generators		✓		
E3	Explain transformation and install transformers		✓	✓	
Line G	**RIGGING**	**19%**	**50%**	**50%**	**100%**
G3	Use rigging tools and equipment in construction and maintenance		✓	✓	
G4	Apply rigging tools and equipment for live line distribution		✓		
Line H	**OVERHEAD DISTRIBUTION (OD)**	**24%**	**40%**	**60%**	**100%**
H3	Construct distribution lines		✓	✓	
H6	Maintain three-phase distribution lines		✓	✓	
H7	Operate overhead distribution (OD) electrical apparatus		✓	✓	
Line I	**UNDERGROUND DISTRIBUTION (UD)**	**16%**	**50%**	**50%**	**100%**
I1	Use underground distribution (UD) equipment and materials		✓		
I2	Construct underground distribution systems		✓	✓	
I3	Maintain underground distribution systems		✓	✓	
Line K	**COMMUNICATION**	**8%**	**30%**	**70%**	**100%**
K1	Plan tailboard meetings		✓	✓	
K4	Apply communication protocols and requirements		✓		
	Total Percentage for BC Powerline Technician Level Two	**100%**			

Training Topics and Suggested Time Allocation

POWERLINE TECHNICIAN – LEVEL 3

			% of Time Allocated to:		
		% of Time	Theory	Practical	Total
Line E	**ELECTRICAL THEORY**	**15%**	**70%**	**30%**	**100%**
E5	Install transformer metering		✓	✓	
Line F	**EQUIPMENT**	**6%**	**100%**	**0%**	**100%**
F3	Use stringing equipment		✓		
Line G	**RIGGING**	**20%**	**50%**	**50%**	**100%**
G5	Use rigging tools and equipment in transmission, construction and maintenance			✓	
G6	Perform live line transmission rigging		✓	✓	
Line I	**UNDERGROUND DISTRIBUTION (UD)**	**17%**	**30%**	**70%**	**100%**
I4	Operate underground distribution electrical apparatus		✓	✓	
Line J	**TRANSMISSION**	**30%**	**50%**	**50%**	**100%**
J1	Describe transmission materials		✓		
J2	Construct transmission lines		✓	✓	
J3	Maintain transmission lines		✓	✓	
J4	Operate transmission electrical apparatus		✓	✓	
Line K	**COMMUNICATION**	**12%**	**30%**	**70%**	**100%**
K1	Plan tailboard meetings		✓	✓	
	Total Percentage for BC Powerline Technician Level Three	**100%**			

Training Topics and Suggested Time Allocation

POWERLINE TECHNICIAN – LEVEL 4

			% of Time Allocated to:		
		% of Time	Theory	Practical	Total
Line E	**ELECTRICAL THEORY**	**24%**	**60%**	**40%**	**100%**
E6	Describe system operation and protection		✓		
E7	Perform system switching		✓	✓	
E8	Operate voltage regulators and capacitors		✓	✓	
Line F	**EQUIPMENT**	**4%**	**100%**	**0%**	**100%**
F3	Use stringing equipment		✓		
Line H	**OVERHEAD DISTRIBUTION (OD)**	**37%**	**60%**	**40%**	**100%**
H6	Maintain three-phase distribution lines		✓	✓	
H7	Operate overhead distribution (OD) electrical apparatus		✓	✓	
H8	Troubleshoot overhead distribution system components		✓	✓	
Line I	**UNDERGROUND DISTRIBUTION (UD)**	**17%**	**70%**	**30%**	**100%**
I5	Troubleshoot underground distribution system components			✓	
Line J	**TRANSMISSION**	**10%**	**100%**	**0%**	**100%**
J3	Maintain transmission lines		✓		
J5	Troubleshoot overhead transmission system components		✓		
Line K	**COMMUNICATION**	**8%**	**50%**	**50%**	**100%**
K6	Apply mentoring techniques		✓	✓	
	Total Percentage for BC Powerline Technician Level Four	**100%**			

Section 3

PROGRAM CONTENT

Powerline Technician

Level 1

Powerline Technician

Line (GAC): A SAFETY AND SAFE WORK PRACTICES

Competency: A1 Apply safety regulations

Objectives

To be competent in this area, the individual must be able to:

- Apply applicable Occupational Health and Safety (OH&S) Regulations.
- Determine requirements applicable in the workplace.

LEARNING TASKS	CONTENT

1. Identify and apply applicable Occupational Health and Safety regulations	• WorkSafeBC (OHS) Regulation
	• Safety Practice Regulation (SPR)
	• WHMIS (MSDS) TDGR
	• Controlled substances:
	  ○ Isopropynol
	  ○ Polychlorinated biphenals (PCBs)
	  ○ Gas and oil
	  ○ SF6
	  ○ Mineral oils
	  ○ Cable oil
	  ○ Propane
	  ○ Battery acid
	  ○ Ampact shells
	  ○ Implosive sleeves
	  ○ Oxyacetylene
	  ○ Nitrogen cylinders

Workplace Achievement Criteria

Given information on Federal and Provincial Occupational Health and Company Specific Safety policies, the learner must correctly follow these procedures and regulations at all times. Employer assessment of performance and logbook entry is required for each task.

Line (GAC): A SAFETY AND SAFE WORK PRACTICES

Competency: A2 Use trade specific personal protective equipment (PPE)

Objectives

To be competent in this area, the individual must be able to:

- Demonstrate the care and use of Personal Protective Equipment.

LEARNING TASKS	CONTENT

1. Identify, describe and use personal protective equipment (PPE)	• UV protective goggles
	• Hand protection
	  ○ Protective gloves
	  ○ Low and high-voltage rubber gloves
	• Safety footwear
	  ○ OHM sticker footwear
	  ○ 9-in. minimum
	  ○ Conductive boots (bare hand, live line transmission work)
	• Safety headwear
	  ○ Class 'E' hardhats
	  ○ Chin straps
	• Safety clothing
	  ○ Fire-retardant clothing
	  ○ Arc-rated clothing
	• High-visibility day and night clothing

2. Demonstrate the care of personal protective equipment (PPE)	• PPE

Achievement Criteria

Performance	The learner will identify, describe and use Personal Protective Equipment.
Conditions	In a lab setting as part of a practical project.
Criteria	Learner will be evaluated on selection and application of PPE.

Workplace Achievement Criteria

Given information and regulations with respect to the use of personal protective equipment in the workplace, the learner must correctly follow relevant procedures and regulations at all times. Employer assessment of performance and logbook entry is required for each task.

Line (GAC): A SAFETY AND SAFE WORK PRACTICES

Competency: A3 Apply limits of approach

Objectives

To be competent in this area, the individual must be able to:

- Recognize potential risks and identify and apply relevant regulations.
- Apply specific work procedures based on limits of approach.

LEARNING TASKS	CONTENT

1. Describe limits of approach and their importance	• Hazards and risks associated with energized lines and equipment
	  • Voltage
	  • Altitude
	  • Humidity
	  • Weather conditions
	  ○ Rain
	  ○ Snow
	  ○ Fog
	  ○ Electrical storms
	  ○ Moisture build-up
	  ○ Ice build-up

2. Identify and describe factors that determine limits of approach	
3. Apply specific work procedures based on limits of approach	• Climbing poles • Hanging transformers • Street lights • Boom truck operations

Achievement Criteria

Performance	The learner will apply limits of approach to energized lines and equipment.
Conditions	In a lab setting as part of a practical project.
Criteria	Learner will be evaluated on limits of approach.

Workplace Achievement Criteria

Given information and regulations with respect to the limits of approach to energized lines and equipment in the workplace, the learner must correctly follow relevant procedures and regulations at all times. Employer assessment of performance and logbook entry is required for each task.

Line (GAC): A SAFETY AND SAFE WORK PRACTICES

Competency: A4 Apply lock-out and tag-out procedures

Objectives

To be competent in this area, the individual must be able to:

- Recognize potential risks and identify relevant procedures with reference to WorkSafeBC Regulation.
- Apply workplace roles and responsibilities.

LEARNING TASKS	CONTENT
1. Describe the purpose and function of lock-out procedures	• Risks and hazards in the workplace • Locking procedures • Tagging procedures • Progressive authorization • Live line permits • Operating diagrams (one line) • Field tags • Station tags • Mimic board and tags

2. Describe the roles and responsibilities of various jobs with respect to lock-out procedures	• Roles
	  ○ Employer
	  ○ Supervisor
	  ○ Journeyperson
	  ○ Apprentice
	  ○ Person in charge (PIC)
	• Operating authority
	• Operating permission
	• Importance of area specific knowledge and experience
	• Station entry authorization
	• Guarantee of isolation
	• Training and authorization for apprentices

3. Describe safety protection guarantees	• Clearances • Test and work • Self-protection
4. Perform various types of lock-out procedures for applicable category of authorization	• Use lock-out tags • Follow lock-out procedures • Switching (de-energization-re-energization)
5. Interpret operating diagrams (one line)	• Schematic diagrams • Symbols

LEARNING TASKS	CONTENT
6. Complete testing for applicable category of authorization	• Identify regulatory operating boundaries • Progressive authorizations
7. Apply lock-out Procedures	• Locking procedures • Tagging procedures • System authorization • Live line permits • Operating diagrams (one line) • Field tags • Station tags • Mimic board and tags

Achievement Criteria

Performance — The learner will:
- Recognize potential risks.
- Identify relevant lock-out and tag-out principles.

Conditions — In a lab setting as part of a practical project.

Criteria — Learner will be evaluated on:
- Principles of lock-out/tag-out.

Workplace Achievement Criteria

Given information and regulations with respect to lock-out and tagging procedures in the workplace, the learner must correctly follow relevant procedures and WorkSafeBC regulations at all times. Employer assessment of performance and logbook entry is required for each task.

Line (GAC): A SAFETY AND SAFE WORK PRACTICES

Competency: A5 Apply grounding and equi-potential bonding principles

Objectives

To be competent in this area, the individual must be able to:

- Recognize potential risks of grounding and equi-potential bonding.
- Demonstrate grounding and bonding principles.

LEARNING TASKS	CONTENT
1. Describe the purpose and function of grounding and equi-potential bonding	• Equi-potential zone • Touch potential • Step potential • Induction hazards
2. Identify and describe grounding and equi-potential bonding	• Running grounds and ground mats • Ground clamps • Ground wire size selection • Pole bands
3. Describe grounding, equi-potential bonding, blocking tools and principles	• Safety grounding plan (SGP) • Use and care of ground sets • Identify grounding switches (hazards) • Grip-all • Approved voltage testing tools
4. Perform safety grounding and equi-potential bonding of overhead and underground lines	• Limits of approach • Safety grounding plan (SGP) • Equi-potential zone • Touch potential • Step potential • Induction hazards • Running grounds and ground mats • Ground clamps • Ground wire size selection • Pole bands • Use and care of ground sets • Identify grounding switches (hazards) • Grip-all • Voltage testing tools

Achievement Criteria

Performance	The learner will: • Recognize potential risks. • Demonstrate appropriate grounding, bonding and equi-potential zone principles.
Conditions	In a lab setting as part of a practical project.
Criteria	Learner will be evaluated on: • Establishment of grounding and equi-potential bonding on structures.

Workplace Achievement Criteria

Given information and regulations with respect to grounding and bonding zones in the workplace, the learner must correctly follow relevant procedures and regulations at all times. Employer assessment of performance and logbook entry is required for each task.

Line (GAC): A SAFETY AND SAFE WORK PRACTICES

Competency: A6 Perform rescue

Objectives

To be competent in this area, the individual must be able to:

- Recognize potential risks.
- Perform rescue.

LEARNING TASKS	CONTENT
1. Describe and perform a pole-top and structure rescue	• Hazard identification • Call for help • Rescue equipment • Pole-top rescue procedures
2. Describe and perform confined-space rescue	• Hazard identification • Call for help • Rescue equipment • Confined-space rescue procedures
3. Describe and perform an aerial-lift rescue	• Hazard identification • Call for help • Rescue equipment • Aerial-lift rescue procedures
4. Describe tower rescue	• Hazard identification • Call for help • Rescue equipment • Tower rescue procedures

Achievement Criteria

Performance	The learner will: • Recognize potential risks. • Implement appropriate rescue procedures.
Conditions	In a lab setting as part of a practical project.
Criteria	Learner will be evaluated on performance of rescue procedures.

Workplace Achievement Criteria

Given information and regulations with respect to rescue situations in the workplace, the learner must correctly follow appropriate procedures and regulations at all times. Employer assessment of performance and logbook entry is required for each task.

Line (GAC): B CLIMBING

Competency: B1 Describe care and use of climbing equipment

Objective

To be competent in this area, the individual must be able to:

- Describe care and use of climbing equipment.

LEARNING TASKS	CONTENT
1. Describe care and use of climbing equipment	• Climbers • Body belt/Harnesses • Fall restrict belt • Second pole strap/worker positioning • Climbing tools and storage
2. Describe basic climbing techniques	• Techniques for wood and steel
3. Describe the use of fall arrest when climbing wood and steel structures	• Fall arrest procedures and equipment for wood and steel structures
4. Describe equipment safety checks required prior to climbing poles, towers and ladders	• Safety check list • Structure inspection • Procedures for safety checks

Workplace Achievement Criteria

Given information and regulations with respect to climbing equipment common to the trade, the learner must demonstrate procedures for the care and safe use of such equipment at all times. Employer assessment of performance is required for each task.

Line (GAC): B CLIMBING

Competency: B2 Climb structures

Objectives

To be competent in this area, the individual must be able to:

- Use climbing equipment to climb structures.

LEARNING TASKS	CONTENT

1. Perform safety checks prior to climbing structures	• Types
	  ○ Wood
	  ○ Steel lattice
	• Tests
	  ○ Hammer
	  ○ Sway
	  ○ Drill
	• Safety checklist
	• Climbing hazards

2. Demonstrate basic climbing techniques using safety equipment	• Full fall arrest

Achievement Criteria

Performance	The learner will use climbing equipment to climb structures.
Conditions	In a lab setting as part of a practical project.
Criteria	Learner will be evaluated on: • Use appropriate equipment • Incorporate safety inspections • Perform proper climbing techniques

Workplace Achievement Criteria

Given information and regulations with respect to climbing equipment common to the trade, the learner must demonstrate procedures for climbing structures in the workplace. Employer assessment of performance and logbook entry is required for each task.

Line (GAC): B CLIMBING

Competency: B3 Use elevated platforms and ladders

Objectives

To be competent in this area, the individual must be able to:

- Describe and apply procedures for working on elevated platforms and ladders.

LEARNING TASKS	CONTENT

1. Describe the installation and use of elevated platforms	• Equipment
	  ○ Elevated platforms
	  ○ Hardware
	  ○ Fall arrest
	  ○ Self Retracting Lanyard (SRL)
	• Installation steps
	• Procedures used to transfer to and from poles and elevated work platforms
	• Hazards with elevated work platforms

2. Describe and use different types of ladders	• Ladder types • Safety
3. Describe and use procedures for transferring from a structure to a suspended ladder	• Fall arrest equipment • Hazards with procedure

Achievement Criteria

Performance	The learner will use safe procedures appropriate for working on an elevated platform.
Conditions	In a lab setting as part of a practical project.
Criteria	Learner will be evaluated on: • Use of fall arrest equipment • Install baker boards • Use ladders • Use baker boards

Workplace Achievement Criteria

Given information and regulations with respect to elevated platforms, the learner must identify and describe safe procedures for working on elevated platforms in the workplace. Employer assessment of performance is required for each task.

Line (GAC): B CLIMBING

Competency: B4 Test for pole (structure) stability

Objectives

To be competent in this area, the individual must be able to:

- Describe and apply procedures for testing the structural stability of poles.

LEARNING TASKS	CONTENT
1. Identify causes of pole failure	• Cracking • Breakage • Rot • Motor Vehicle Accident (MVA) • Storm damage

2. Describe and inspect poles for stability and soundness	• Visual inspection
	• Test types
	  ○ Hammer
	  ○ Sway
	  ○ Drill

3. Describe temporary anchors and support methods	• Pole support techniques
	  ○ Cross-arm support
	  ○ Boom truck

4. Describe methods used to straighten poles	• Pole straightening techniques
	  ○ Rope
	  ○ Equipment
	  ○ Line truck
	  ○ Temporary anchor

Achievement Criteria

Performance	The learner will demonstrate safe procedures for testing the structural stability of poles.
Conditions	In a lab setting as part of a practical project.
Criteria	The learner will: • Test structures • Support structures

Workplace Achievement Criteria

Given information and regulations with respect to testing the structural stability of poles, the learner must identify, describe and use safe work procedures in the workplace. Employer assessment of performance and logbook entry is required for each task.

Line (GAC): C POLICIES AND REGULATIONS

Competency: C1 Identify environmental hazards

Objectives

To be competent in this area, the individual must be able to:

- Identify environmental hazards and apply regulations common to the trade.

LEARNING TASKS	CONTENT

1. Identify environmental hazards	• Hazard types
	  ○ Birds
	  ○ Spills
	  ○ Fire conditions
	• Precautions required
	  ○ Brush burning
	  ○ Chemical spraying
	  ○ Transferring hazardous materials
	  ○ PPE
	• Chemical spill response

2. Identify and apply environmental regulations and guidelines	• Fisheries Act
3. Identify and apply environmental precautions	• Barricades and containment • Absorbents

Workplace Achievement Criteria

Given information and regulations with respect to environmental hazards and regulations, the learner must identify and describe safe work procedures in the workplace. Employer assessment of performance and logbook entry is required for each task.

Line (GAC): C POLICIES AND REGULATIONS

Competency: C2 Apply industry safety regulations

Objectives

To be competent in this area, the individual must be able to:

- Identify and apply industry safety regulations common to the trade.

LEARNING TASKS	CONTENT

1. Identify licensing/certification requirements	• Driver licensing
	  ○ Class
	  ○ Endorsements
	• First Aid
	• Transportation of dangerous goods (TDG)

2. Describe components of pre-trip/pre-use inspections	• Requirements • Exemptions
3. Describe WorkSafe (OHS) Regulations	• Location of applicable OHS Regulation • WHMIS
4. Describe utility standards and/or Canadian Electrical Code	• Canadian Electrical Code and Canadian Standards Association (CSA)

Workplace Achievement Criteria

Given information on workplace situations, the learner must identify and describe the regulations that apply in the workplace. Employer assessment of performance and logbook entry is required for each task.

Line (GAC): D TOOLS AND INSTRUMENTS

Competency: D1 Use hand tools

Objectives

To be competent in this area, the individual must be able to:

- Describe, use and care for hand tools

LEARNING TASKS	CONTENT
1. Describe and apply good housekeeping as it relates to the care of hand tools	• Storage • Cleaning • Sharpen • Lubricate
2. Use hand tools	• Pliers • Wrenches • Knives • Hammers • Bolt/wire cutters • Presses • Shovels • Digging bars • Spoons • Tampers • Axes • Peavey/Cant hooks • Semi-con stripper • Insulation remover • Propane torch

Achievement Criteria

Performance	The learner will use and care for hand tools.
Conditions	In a lab setting as part of a practical project.
Criteria	The learner will: • Select appropriate tools • Maintain and store tools

Workplace Achievement Criteria

Given information on workplace situations, the learner must identify, describe and use hand tools in the workplace. Employer assessment of performance is required for each task.

Line (GAC): D TOOLS AND INSTRUMENTS

Competency: D2 Use power tools

Objectives

To be competent in this area, the individual must be able to:

- Use and care for power tools.

LEARNING TASKS	CONTENT
1. Demonstrate use of electric power tools	• Drills • Chain saws • Cable saws
2. Demonstrate use of hydraulic power tools	• Drill • Tamper • Cutter • Press • Jacks
3. Demonstrate use of gas power tools	• Drill • Chain saw
4. Demonstrate use of powder-actuated wedge tools	• Wedge connections

Achievement Criteria

Performance	The learner will use and care for power tools
Conditions	In a lab setting as part of a practical project.
Criteria	The learner will: • Select appropriate tooling • Maintain and store tools

Workplace Achievement Criteria

Given information on workplace situations, the learner must identify, describe and use power tools in the workplace. Employer assessment of performance is required for each task.

Line (GAC): D TOOLS AND INSTRUMENTS

Competency: D3 Use live line tools

Objectives

To be competent in this area, the individual must be able to:

- Describe, use and care for live line tools.

LEARNING TASKS	CONTENT

1. Describe the care and use of cover-up	• Cover-up equipment
	  ○ Line guards
	  ○ Arm guards
	  ○ Pole guards

2. Describe the care and use of rubber	• Blankets • Hoses

3. Describe the care and use of fibre-reinforced plastic (FRP)	• Stick types
	  ○ Universal
	  ○ Strain
	  ○ Grip-all (shot-gun)
	  ○ Wire tong
	  ○ Insulator cradle
	• Jibs for line/three-phase lift attachments

4. Describe the care and handling (transporting) of live line tools	• Cleaning procedures • Waxing procedures • Insulated booms
5. Describe procedures for field checks of live line tools	• Inspections • Stickers

Achievement Criteria

Performance	The learner will use and care for live line tools.
Conditions	In a lab setting as part of a practical project.
Criteria	Learner will: • Select appropriate tools • Maintain and store tools

Workplace Achievement Criteria

Given information on workplace situations, the learner must identify and describe the use and care of live line tools in the workplace. Employer assessment of performance is required for each task.

Line (GAC): D TOOLS AND INSTRUMENTS

Competency: D4 Use test instruments

Objectives

To be competent in this area, the individual must be able to:

- Describe, use and care for test instruments.

LEARNING TASKS	CONTENT
1. Describe care and use of various test instruments	• Multimeter • Megger test set • Phase sequence indicators • Recording meters • Fault indicator • Cable locators • Cable identifiers • Transformer tester • Potential testers

Achievement Criteria

Performance	The learner will use and care for test instruments.
Conditions	In a lab setting as part of a practical project.
Criteria	The learner will: • Select appropriate instruments • Maintain and store instruments

Workplace Achievement Criteria

Given information on workplace situations, the learner must identify, describe and use test instruments in the workplace. Employer assessment of performance is required for each task.

Line (GAC): E ELECTRICAL THEORY

Competency: E1 Apply electrical fundamentals

Objectives

To be competent in this area, the individual must be able to:

- Describe and demonstrate the fundamentals of electrical theory and principles.

LEARNING TASKS	CONTENT

1. Describe basic principles of electricity	• Electron theory
	• Electromagnetic theory
	• Alternating current fundamentals for single-phase
	• Direct current fundamentals
	• Ohm's law
	• Watt's law
	• Kirchoff's law
	• Circuits
	  ○ Series
	  ○ Parallel
	  ○ Combination
	  ○ Edison 3-wire

Line (GAC): E ELECTRICAL THEORY

Competency: E3 Explain transformation and install transformers

Objectives

To be competent in this area, the individual must be able to:

- Explain single-phase transformers.
- Install single-phase transformers.

LEARNING TASKS	CONTENT
1. Describe the principles of operation of single-phase transformers	• Principles of operation of single-phase transformers • Single-phase transformer types • Series and parallel
2. Describe single-phase transformer components and construction	• Components of single-phase transformers • Tap changers
3. Perform single-phase transformer calculations	• Single-phase transformer ratios
4. Describe back-feed	• Hazards and safety procedures related to back-feed
5. Describe paralleling procedures	• Paralleling procedures • Matching impedances
6. Describe open neutrals in single-phase transformer secondaries	• Open neutrals • Single-phase transformer secondaries
7. Install single-phase transformers	• Hazards and safety procedures • Applicable codes and standards • Transformer configurations • Voltage check • Load checks

Achievement Criteria

Performance	The learner will install single-phase transformer.
Conditions	In a lab setting as part of a practical project.
Criteria	The learner will: • Install transformer to specifications • Perform voltage checks • Use PPE

Workplace Achievement Criteria

Given information on workplace situations, the learner must install single-phase transformer in the workplace. Employer assessment of performance and logbook entry is required for each task.

Line (GAC): E ELECTRICAL THEORY

Competency: E4 Install self-contained metering

Objectives

To be competent in this area, the individual must be able to:

- Identify and describe self-contained metering.
- Install self-contained meters.

LEARNING TASKS	CONTENT
1. Identify and describe components of self-contained metering	• Meter components
2. Install single-phase meters	• Meter socket safety checks
3. Identify smart meter infrastructure	• Smart meter components

Achievement Criteria

Performance	The learner will perform meter socket safety checks.
Conditions	In a lab setting as part of a practical project.
Criteria	The learner will: • Use PPE transformer to specifications • Use voltmeter • Install self-contained meter

Line (GAC): F EQUIPMENT

Competency: F1 Identify mobile line equipment

Objectives

To be competent in this area, the individual must be able to:

- Identify and describe the operation of various types of mobile equipment.

LEARNING TASKS	CONTENT

1. Identify and describe various types of mobile line equipment	• Vehicles
	  ○ Road
	  ○ Rail
	  ○ All terrain
	  ○ Track machines
	• Trailers
	• Aerial manlift equipment
	• Boom truck equipment
	  ○ Truck cranes
	  ○ Pole derricks
	• Digging and trenching equipment
	  ○ Augers
	  ○ Backhoes
	  ○ Excavators
	  ○ Trenchers
	• Boats
	• Helicopters
	• Basics of hydraulic systems and components

2. Describe the operation of various mobile line equipment	• Operating principles for hydraulic equipment
	  ○ Hiabs
	  ○ Truck cranes
	  ○ Aerial manlifts
	  ○ Winches
	  ○ Augers
	• Pre-use checks
	• On-the-job checks
	• Emergency operation of hydraulic booms and outriggers

Line (GAC): F EQUIPMENT

Competency: F2 Use hydraulically-equipped vehicles

Objectives

To be competent in this area, the individual must be able to:

- Use and care for hydraulically-equipped vehicles.

LEARNING TASKS	CONTENT
1. Operate hydraulically-equipped vehicles	• Hazards and safety procedures • Emergency operations • Routine operations • Perform pre-use checks • Perform on-job checks
2. Operate hydraulic equipment on vehicles	• Augers • Winches • Buckets • Booms

Achievement Criteria

Performance	The learner will use hydraulically-operated equipment.
Conditions	In a lab setting as part of a practical project.
Criteria	The learner will: • Set up and operate hydraulic equipment • Use fall arrest • Follow hand signals • Demonstrate emergency operations

Workplace Achievement Criteria

Given workplace situations, the learner must operate a hydraulically equipped vehicle. Employer assessment of performance is required for each task.

Line (GAC): G RIGGING

Competency: G1 Explain rigging, hoisting and lifting equipment

Objectives

To be competent in this area, the individual must be able to:

- Describe principles of work, force and mechanical advantage.
- Perform calculations related to rigging.

LEARNING TASKS	CONTENT

1. Identify and describe key principles related to rigging	• Force
	  ○ Four types
	• Work
	• Mechanical advantage
	  ○ Six basic types
	• Friction

2. Perform calculations related to rigging	• Calculations
	  ○ Force
	  ○ Work
	  ○ Mechanical advantage
	  ○ Friction

Workplace Achievement Criteria

Given workplace situations, the learner must identify and describe the application of rigging principles related to work, force and mechanical advantage, and perform related rigging calculations in the workplace. Employer assessment of performance is required for each task.

Line (GAC): G RIGGING

Competency: G2 Use lifting, rigging and hoisting equipment

Objectives

To be competent in this area, the individual must be able to:

- Describe, use and care for lifting tools and equipment.

LEARNING TASKS	CONTENT
1. Describe the fundamentals of rigging equipment	• Components • Tools vs equipment • Design factor

2. Identify, describe, and use various types of lifting tools and equipment	• Wire rope
	• Fibre rope
	• Chains
	• Hoists
	• Blocks
	  ○ Rope
	  ○ Snatch
	• Types and sizes of gins
	  ○ Transformer
	  ○ Cross-arm
	• Approved hardware
	  ○ Drop forged shackles
	  ○ Hooks
	  ○ Working load limit (WLL) and size stamps

3. Describe use and care of lifting tools and equipment	• Wire rope • Fibre rope • Synthetic rope • Hoists • Blocks • Chains • Design/safety factors • Shock loading • Slings • Shackles
4. Identify, describe and use reference information sources for rigging	• WorkSafeBC Regulation • Rigger's handbooks/manuals • Manufacturers' specifications • Engineering specifications

Achievement Criteria

Performance	The learner will use and care for all lifting tools and equipment.
Conditions	In a lab setting as part of a practical project.
Criteria	The learner will: • Apply rigging principles • Select appropriate components

Workplace Achievement Criteria

Given workplace situations, the learner must use and care for lifting tools and equipment. Employer assessment of performance and logbook entry is required for each task.

Line (GAC): H OVERHEAD DISTRIBUTION (OD)

Competency: H1 Describe overhead distribution materials

Objectives

To be competent in this area, the individual must be able to:

- Describe materials used in overhead distribution systems.

LEARNING TASKS	CONTENT

1. Identify and describe materials used in overhead distribution	• Poles
	  ○ Height
	  ○ Class
	  ○ Type
	• Cross-arms and timbers
	• Bolts
	  ○ Types
	  ○ Sizes
	• Hardware to support conductors
	  ○ Sky pin
	  ○ Arm pin
	  ○ Clevis
	• Insulators
	• Hardware to support electrical apparatus
	• Street light materials
	• Guying materials
	• Anchoring materials
	• Conductors/cables
	  ○ Types
	  ○ Sizes
	• Dead-ending conductor materials
	• Tying-in/clipping materials
	• Connectors
	  ○ Types
	• Cellular infrastructure

Line (GAC): H OVERHEAD DISTRIBUTION (OD)

Competency: H2 Describe overhead distribution systems

Objectives

To be competent in this area, the individual must be able to:

- Describe overhead distribution systems.

LEARNING TASKS	CONTENT

1. Identify and describe overhead distribution systems	• Under-construction or in-service
	• Energized or de-energized
	• Systems
	  ○ Wye
	  ○ Delta
	  ○ Looped
	  ○ Radial
	• Line voltage
	• Line source and destination
	• Circuit identifier
	• Conductor type and size
	• Basic structural type
	• Pole mounted apparatus
	• Use of circuit diagrams

Workplace Achievement Criteria

Given workplace situations, the learner must describe the overhead distribution systems. Employer assessment of performance and logbook entry is required for each task.

Line (GAC): H OVERHEAD DISTRIBUTION (OD)

Competency: H3 Construct distribution lines

Objectives

To be competent in this area, the individual must be able to:

- Describe and construct overhead distribution lines.

LEARNING TASKS	CONTENT

1. Describe basic construction of overhead distribution lines	• Pole selection
	  ○ Class
	• Job planning
	  ○ Work orders
	• Public safety awareness
	• Delivery of poles and materials
	• Digging pole holes
	• Pole framing for different structure types
	• Installation of pole hardware
	• Setting poles with line trucks
	• Installation of various types of anchors
	• Installation of guy wires
	• Stringing and splicing conductors
	• Installation of secondary services
	• Securing conductors
	• Installation and connecting system grounds

Achievement Criteria

Performance	The learner will utilize methods of construction for overhead distribution lines.
Conditions	In a lab setting as part of a practical project.
Criteria	The learner will: • Select materials • Follow specifications/standards

Workplace Achievement Criteria

Given workplace situations, the learner must describe and utilize methods of construction for overhead distribution lines. Employer assessment of performance and logbook entry is required for each task.

Line (GAC): H OVERHEAD DISTRIBUTION (OD)

Competency: H4 Demonstrate safe work practices for live line work

Objectives

To be competent in this area, the individual must be able to:

- Describe safe work procedures for live lines.
- Describe the difference between a regulated utilties system and unregulated system.

LEARNING TASKS	CONTENT

1. Identify safe work practices	• Hazards
	• Safe work practices
	• Various types of structures
	• Hazards
	• Safe work practices
	• Jurisdictional authority
	  ○ Federal Mines Act
	  ○ WorkSafeBC
	  ○ BC Hydro
	  ○ FortisBC
	• Various work methods

Line (GAC): H OVERHEAD DISTRIBUTION (OD)

Competency: H5 Maintain single-phase distribution lines

Objectives

To be competent in this area, the individual must be able to:

- Describe and use live line maintenance procedures.
- Maintain single-phase overhead distribution lines.

LEARNING TASKS	CONTENT
1. Describe and use single-phase live line procedures	• General maintenance procedures for live line work
2. Calculate weights and forces on tools and equipment	• Tools and rigging • Conductor weights

Achievement Criteria

Performance	The learner will use and care for all lifting tools and equipment.
Conditions	In a lab setting as part of a practical project.
Criteria	The learner will be evaluated on: • Application of rigging principles • Component selection

Workplace Achievement Criteria

Given workplace situations, the learner must perform Live Line maintenance work on overhead single-phase distribution lines in the workplace. Employer assessment of performance is required for each task.

Line (GAC): I UNDERGROUND DISTRIBUTION (UD)

Competency: I1 Use underground distribution (UD) equipment and materials

Objectives

To be competent in this area, the individual must be able to:

- Identify and describe equipment and materials used in underground distribution systems.

LEARNING TASKS	CONTENT

1. Identify and describe equipment and materials used in underground distribution	• Hardware
	• Conductors
	  ○ Sizes and types
	  ○ Primary and secondary
	• Connectors and covers
	  ○ Primary and secondary
	• Cable termination methods
	  ○ Primary and secondary
	• Tapes
	• Approved solvents, cleaners and lubricants
	• Parking cables and by-pass apparatus
	  ○ Feed-through module
	• Secondary boxes
	• Manholes
	• Junction boxes
	• Kiosks
	• Switches

2. Describe underground distribution power systems	• Under-construction or in-service • Energized or de-energized • Distribution or transmission • Single or three-phase • Line voltage • Line source and destination • Line/circuit number • Cable tags • Phasing marks and colours • Cable types • Direct buried or in duct • Cable protection • Identify cable on one line diagrams • Radial and loop feeds

Line (GAC): K COMMUNICATION

Competency: K1 Plan tailboard meetings

Objectives

To be competent in this area, the individual must be able to:

- Describe the purpose of tailboard meetings.
- Participate in tailboard meetings.

LEARNING TASKS	CONTENT
1. Identify and describe the function of tailboard meeting	• Crew duties • Crew qualifications and experience • Sequence and schedule of work • Hazards and safety procedures
2. Participate in tailboard meetings	• Assessment and communication of potential hazards • Monitoring progress of job • Clear task assignments

Achievement Criteria

Performance — The learner will:

- Complete and present tailboard forms
- Engage crew in discussion

Conditions — In a lab setting as part of a practical project.

Criteria — The learner will be evaluated on:

- Job specifications
- Hazard identification and mitigation
- Written and oral communication

Workplace Achievement Criteria

Given workplace situations, the learner must identify the purpose and necessity of tailboard meetings in the workplace. Employer assessment of performance and logbook entry is required for each task.

Line (GAC): K COMMUNICATION

Competency: K2 Communicate using hand signals

Objectives

To be competent in this area, the individual must be able to:

- Use hand signals to communicate.

LEARNING TASKS	CONTENT

1. Use hand signals relevant to the workplace	• Types and meanings of hand signals
	  ○ Stringing
	  ○ Equipment lifts

Achievement Criteria

Performance	The learner will use hand signals.
Conditions	In a lab setting as part of a practical project.
Criteria	The learner will be evaluated on: • Comprehension • Communication

Workplace Achievement Criteria

Given workplace situations, the learner must effectively communicate using hand signals in the workplace. Employer assessment of performance and logbook entry is required for each task.

Line (GAC): K COMMUNICATION

Competency: K3 Communicate using electronic devices and systems

Objectives

To be competent in this area, the individual must be able to:

- Communicate using electronic devices and systems.

LEARNING TASKS	CONTENT
1. Demonstrate the use of electronic communication systems	• Cellular telephones • Two-way radios • Email • Computers • Communications protocols ○ Repeat back protocols

Achievement Criteria

Performance	The learner will use electronic communication devices.
Conditions	In a lab setting as part of a practical project.
Criteria	The learner will be evaluated on switching communication for authorization purposes.

Workplace Achievement Criteria

Given workplace situations, the learner must effectively communicate using electronic tools and systems in the workplace. Employer assessment of performance is required for each task.

Line (GAC): K COMMUNICATION

Competency: K5 Apply communication techniques

Objectives

To be competent in this area, the individual must be able to:

- Describe methods of communication.
- Communicate with people.
- Apply reporting processes.

LEARNING TASKS	CONTENT
1. Describe methods of communication	• Listening skills • Questioning skills • Following verbal directions • Body language • Written directions • Trade terminology

2. Communicate with people	• Interpersonal skills
	• Professionalism
	  ○ Time management
	  ○ LEAN management principles
	  ○ Punctuality
	  ○ Respect for authority
	  ○ Stewardship of materials
	• Accepting constructive feedback
	• Respect for customer property
	• Respect for other trades
	• Customers (layperson terms)
	• Employer representation
	• First impression

3. Apply reporting processes	• Policies • Safety considerations • Emergency protocols • Logbooks/diaries

Level 2

Powerline Technician

Line (GAC): D TOOLS AND INSTRUMENTS

Competency: D4 Use test instruments

Objectives

To be competent in this area, the individual must be able to:

- Describe, use and care for advanced test instruments.

LEARNING TASKS	CONTENT
1. Identify and use advanced test instruments	• Phasing sticks • DC Hi-Pot adapters • Rubber glove voltage leakage tester • Gas detectors • Safety ground tester (Megger)

Achievement Criteria

Performance	The learner will: • Use test instruments • Maintain and care for test instruments • Use specialized PPE
Conditions	In a lab setting as part of a practical project
Criteria	The learner will be evaluated on: • Accuracy • Safety

Workplace Achievement Criteria

Given tasks and situations at work, the learner must demonstrate the use and care of advanced test instruments in the workplace. Employer assessment of performance is required for each task.

Line (GAC): E ELECTRICAL THEORY

Competency: E1 Apply electrical fundamentals

Objectives

To be competent in this area, the individual must be able to:

- Apply advanced electrical theory.

LEARNING TASKS	CONTENT
1. Apply advanced principles of electricity	• Alternating current fundamentals for three phase • Characteristics of Wye-connected systems • Characteristics of Delta-connected systems • Interconnections between Delta and Wye systems

Line (GAC): E ELECTRICAL THEORY

Competency: E2 Describe operation of motors and generators

Objectives

To be competent in this area, the individual must be able to:

- Describe the operation of three-phase motors and generators.

LEARNING TASKS	CONTENT
1. Describe the operating characteristics of single and three-phase motors	• Types of single and three-phase alternating current (A/C) motors ○ Phase rotation
2. Describe the effects of an open phase on a three-phase motor under starting and under running conditions	• Voltage conditions
3. Describe the effects of over and under voltage on motors	• Voltage conditions
4. Describe the effects on a utility system of full voltage starting large motors	• Demand on-system conditions
5. Describe the effects of voltage imbalance on three-phase motors	• Motor performance

Line (GAC): E ELECTRICAL THEORY

Competency: E3 Explain transformation and install transformers

Objectives

To be competent in this area, the individual must be able to:

- Apply three-phase transformation prinicples.
- Install three-phase transformer banks.

LEARNING TASKS	CONTENT
1. Apply principles and characteristics of three-phase transformer banks	• Wye transformation systems • Delta transformation systems • Ferroresonance • Calculating load checks
2. Apply three-phase transformer bank connections	• Vectoring principles • Phasor diagrams
3. Describe back-feed on three-phase transformer banks	• Circuits that create back-feed • Hazards and safety procedures related to back-feed
4. Apply procedures and precautions for three-phase transformer banks	• Phasing • Paralleling ○ Angular displacement • Energizing/De-energizing • Sequence (rotation) • Troubleshooting

5. Install three-phase transformer banks	• Hazards and procedures
	• Codes and standards
	• Transformer connections
	  ○ Wye system
	  ○ Delta system
	• Voltage checks
	• Load checks
	• Paralleling three-phase transformers
	• Winding circuits
	  ○ Series/parallel
	  ○ Taps/multi-voltage

Achievement Criteria

Performance	The learner will: • Install three-phase transformers • Parallel three-phase transformers • Use test instruments
Conditions	In a lab setting as part of a practical project
Criteria	The learner will be evaluated on: • Safety • Application of advanced electrical theory • Use of test instruments

Workplace Achievement Criteria

Given workplace situations, the learner must install three-phase transformers/three-phase transformer banks in the workplace. Employer assessment of performance and logbook entry is required for each task.

Line (GAC): G RIGGING

Competency: G3 Use rigging tools and equipment in construction and maintenance

Objectives

To be competent in this area, the individual must be able to:

- Apply rigging principles for construction and maintenance.

LEARNING TASKS	CONTENT

1. Apply rigging principles for construction and maintenance	• Weights and forces
	• Tool and equipment requirements
	• Procedures
	• Manufacturers' and engineering specifications
	  ○ ASTM
	  ○ ASME
	  ○ ANSI
	• Connecting devices
	• Design factors
	  ○ Working load limit (WLL) and size stamps
	  ○ Manufacturers' ultimate tensile strength (UTS)
	• WorkSafeBC Regulation
	• Rigging manuals

Achievement Criteria

Performance	The learner will: • Apply rigging theory • Select appropriate rigging
Conditions	In a lab setting as part of a practical project.
Criteria	The learner will be evaluated on: • Care and maintenance of equipment • Use of rigging • Accuracy of applied theory

Workplace Achievement Criteria

Given workplace situations, the learner must demonstrate the use of rigging tools and equipment for distribution construction and maintenance in the workplace. Employer assessment of performance and logbook entry is required for each task.

Line (GAC): G RIGGING

Competency: G4 Apply rigging tools and equipment for live line distribution

Objectives

To be competent in this area, the individual must be able to:

- Apply rigging tools and equipment for live line distribution.

LEARNING TASKS	CONTENT

1. Use tools and equipment for live line distribution rigging	• FRP sticks
	• Slings
	• Rope blocks
	• Lever-operated hoists
	• Capstan winches
	• Hydraulic jibs and winches
	• Rope principles
	  ○ Selection
	  ○ Care, storage and inspection

2. Source and apply information for live line distribution rigging	• Weights and forces of conductors • Rated loads of lifting tools

Line (GAC): H OVERHEAD DISTRIBUTION (OD)

Competency: H3 Construct distribution lines

Objectives

To be competent in this area, the individual must be able to:

- Construct overhead distribution lines using advanced methods.
- Demonstrate advanced grounding and equi-potential bonding principles.

LEARNING TASKS	CONTENT

1. Construct overhead distribution lines using advanced methods	• Engineering standards
	• Line design
	  ○ Surveying transit
	  ○ Structure Data Sheets (SDS)
	  ○ Construction drawings
	• Setting poles
	  ○ Conventional
	  – Boom truck
	  ○ Unconventional
	  – Helicopter
	  – Specialized equipment
	• Conductor sagging methods
	• Dead-ending conductors
	• Installing street lighting
	• Stringing and splicing conductors

2. Apply grounding and equi-potential bonding principles	• Pole sets • Cross-arm change • Stringing conductors

Achievement Criteria

Performance The learner will:

- Use methods of construction for overhead distribution lines

Conditions In a lab setting as part of a practical project.

Criteria The learner will be evaluated on:

- Select materials
- Follow specifications/standards
- Safely construct overhead distribution lines

Workplace Achievement Criteria

Given workplace situations, the learner must demonstrate advanced construction work methods and design of overhead distribution lines in the workplace. Employer assessment of performance is required for each task.

Line (GAC): H OVERHEAD DISTRIBUTION (OD)

Competency: H6 Maintain three-phase distribution lines

Objectives

To be competent in this area, the individual must be able to:

- Apply live line maintenance procedures.
- Maintain three-phase overhead distribution lines.

LEARNING TASKS	CONTENT
1. Apply three-phase live line procedures while performing maintenance work	• Distribution Live Line Maintenance work procedures • General maintenance procedures for Live Line work
2. Calculate weights and forces on tools and equipment	• Tools and rigging • Conductor weights and forces
3. Apply live line procedures for using powder-actuated wedge-type connections	• Installation of powder-actuated wedge-type connections

Achievement Criteria

Performance — The learner will:

- Use live line tools
- Calculate weights and forces
- Maintain limits of approach
- Perform live line work procedures

Conditions — In a lab setting as part of a practical project

Criteria — The learner will be evaluated on:

- Safety
- Accuracy of calculations
- Safe work practices
- Care and use of tools
- Tool selection

Workplace Achievement Criteria

Given workplace situations, the learner must perform Live Line maintenance work on three phase overhead distribution lines in the workplace. Employer assessment of performance is required for each task.

Line (GAC): H OVERHEAD DISTRIBUTION (OD)

Competency: H7 Operate overhead distribution (OD) electrical apparatus

Objectives

To be competent in this area, the individual must be able to:

- Operate overhead distribution electrical apparatus.

LEARNING TASKS	CONTENT

1. Operate overhead distribution electrical apparatus	• Single disconnect switches
	  ○ Fused
	  ○ Solid
	• Lightning arrestors
	  ○ Function
	• Street lighting apparatus
	• Air brake switches

Achievement Criteria

Performance	The learner will: • Operate overhead apparatus • Use specialized PPE/tools
Conditions	In a lab setting as part of a practical project.
Criteria	The learner will be evaluated on: • Safety • Sequence • Use of PPE/tools

Workplace Achievement Criteria

Given workplace situations, the learner install and operate overhead distribution electrical apparatus in the workplace. Employer assessment of performance is required for each task.

Line (GAC): I UNDERGROUND DISTRIBUTION (UD)

Competency: I1 Use underground distribution (UD) equipment and materials

Objectives

To be competent in this area, the individual must be able to:

- Use equipment and materials used in underground distribution systems.

LEARNING TASKS	CONTENT

1. Use equipment and materials for underground distribution	• Switchgear
	• Live-front and dead-front equipment
	• Cable types
	  ○ Concentric neutral
	  ○ Shielded
	  ○ Non-shielded
	• One-line diagrams
	• Material selection

2. Determine status of single and three-phase underground distribution systems	• Under-construction or in-service
	• Energized or de-energized
	• Distribution or transmission
	• Line voltage
	• Line source and destination
	• Line designation
	• Cable tags
	• Phasing marks and colours
	• Cable types
	  ○ Concentric neutral
	  ○ Shielded
	  ○ Non-shielded
	• Direct buried or in duct
	• Cable protection
	  ○ On poles
	  ○ Under roads
	• One-line diagrams
	  ○ Radial
	  ○ Loop feeds
	• Faulted circuit indicator (FCI)

Line (GAC): I UNDERGROUND DISTRIBUTION (UD)

Competency: I2 Construct underground distribution systems

Objectives

To be competent in this area, the individual must be able to:

- Construct underground distribution systems.
- Access underground distribution systems.

LEARNING TASKS	CONTENT
1. Describe basic underground distribution (UD) system components	• Electrical and civil drawings • System grounding/neutral connections • Terminal poles • Junction boxes • Vaults and pull boxes • Switching kiosks • Secondary boxes
2. Describe procedures for entering underground (UG) confined spaces	• Testing • Ventilation • Monitoring • Rescue plans
3. Apply grounding and equi-potential bonding principles	• Grounding mat • Feed-throughs • Grounding elbows
4. Install primary and secondary cables	• Single and three-phase • Socks • Capstans • Single and three-phase underground distribution (UD) services
5. Identify phases and cable	• Cable identifier • Tug test
6. Participate in job planning	• Work orders • Drawing and schematics review
7. Install apparatus	• Plans and procedures • Terminal pole • Vista • Standards • Junction box
8. Perform cable terminations	• Elbows • Terminators • Splices

Achievement Criteria

Performance	The learner will: • Access workspace • Apply grounding and equi-potential bonding • Install underground apparatus • Use underground tools and test instruments
Conditions	In a lab setting as part of a practical project.
Criteria	The learner will be evaluated on: • Safety • Installation of apparatus • Selection and use of tools and equipment • Written and verbal communication

Workplace Achievement Criteria

Given workplace situations, the learner must demonstrate methods and procedures for constructing underground distribution systems in the workplace. Employer assessment of performance is required for each task.

Line (GAC): I UNDERGROUND DISTRIBUTION (UD)

Competency: I3 Maintain underground distribution systems

Objectives

To be competent in this area, the individual must be able to:

- Maintain underground distribution sytems.

LEARNING TASKS	CONTENT
1. Identify grounding and equi-potential bonding requirements for underground distribution (UD) systems	• Grounding procedures • Tagging procedures • Grounding kits • Hazard identification • Underground distribution (UD) standards
2. Apply grounding and equi-potential bonding	• Test for potential • Tag-out/lock-out procedures • Tools and equipment

Achievement Criteria

Performance — The learner will:

- Access workspace
- Apply grounding and equi-potential bonding
- Install underground apparatus
- Use underground tools and test instruments

Conditions — In a lab setting as part of a practical project.

Criteria — The learner will be evaluated on:

- Safety
- Installation of apparatus
- Selection and use of tools and equipment
- Written and verbal communication

Workplace Achievement Criteria

Given workplace situations, the learner must select, identify and apply procedures for underground distribution systems in the workplace. Employer assessment of performance is required for each task.

Line (GAC): K COMMUNICATION

Competency: K1 Plan tailboard meetings

Objectives

To be competent in this area, the individual must be able to:

- Lead a basic tailboard meeting.

LEARNING TASKS	CONTENT
1. Plan and prepare a tailboard meeting	• Crew duties • Crew complement, qualifications and experience • Sequence and schedule of work • Hazard identification and risk assessment • Safety procedures • Tooling and equipment requirements • Calculations of weights and forces • Limits of approach
2. Execute and debrief tailboard meetings	• Potential hazard assessment • Work methods • Communication • Monitoring of job progress • Task assignments

Achievement Criteria

Performance	The learner will: • Complete and present tailboard forms • Engage crew in discussion
Conditions	In a lab setting as part of a practical project.
Criteria	The learner will be evaluated on: • Job specifications • Hazard identification and mitigation • Written and oral communication

Workplace Achievement Criteria

Given workplace situations, the learner must be able to plan, prepare and lead tailboard meetings as needed a in the workplace.

Line (GAC): K COMMUNICATION

Competency: K4 Apply communication protocols and requirements

Objectives

To be competent in this area, the individual must be able to:

- Apply communication protocols and requirements.

LEARNING TASKS	CONTENT

1. Identify protocols and requirements	• Authorities
	  ○ Provincial regulatory
	  ○ Power system
	  ○ Emergency services

2. Apply protocols	• Workplace accident • Incidents • Reporting requirements • Job-related terminology • Scene lockdown

Workplace Achievement Criteria

Given workplace situations, the learner must demonstrate methods and skills for communicating with jurisdictional authorities, power system authorities, emergency services, co-workers and other disciplines in the workplace. Employer assessment of performance is required for each task.

Level 3

Powerline Technician

Line (GAC): E ELECTRICAL THEORY

Competency: E5 Install transformer metering

Objectives

To be competent in this area, the individual must be able to:

- Select and install three-phase meters.

LEARNING TASKS	CONTENT
1. Explain the use of and precautions required for potential and current three-phase transformers in primary and secondary metering	• Potential and current in three phase transformers • Primary and secondary metering
2. Install and perform meter socket safety checks	• Primary and secondary metering
3. Select meters for various installations	• Three-phase meter operation • Self-contained • Transformer
4. Select CTs and PTs	• Current transformers • Potential transformers
5. Install meters	• 400 A single-phase • Canadian Electrical Code (CEC)
6. Describe power factor	• Effects of power factor on electric circuits • Power factor correction • Power factor calculation • Power factor formula and power triangle

Achievement Criteria

Performance — The learner will:

- Apply metering theory
- Install transformer metering
- Use tools and tests instruments

Conditions — In a lab setting as part of a practical project.

Criteria — The learner will be evaluated on:

- Accuracy of calculations
- Meter selection
- Properties of tools and test instruments
- Safety

Workplace Achievement Criteria

Given workplace situations, the learner must select, install and accurately read three phase meters in the workplace. Employer assessment of performance is required for each task.

Line (GAC): F EQUIPMENT

Competency: F3 Use stringing equipment

Objectives

To be competent in this area, the individual must be able to:

- Describe conductor stringing equipment.

LEARNING TASKS	CONTENT
1. Describe stringing of conductors	• Tension stringing • Non-tension stringing • Sagging • Reeling out of conductors • Conductor splicing • Double socking • Setting up puller and tension sites

2. Describe stringing tools and equipment	• Reel trailers
	• Wire tensioners
	• Pullers
	• Stringing sheaves and blocks
	• Finger lines
	• Pulling lines
	• Pulling line accessories
	  ○ Swivels
	  ○ Kellum grips
	  ○ Clevis
	• Equi-potential grounding & bonding

Workplace Achievement Criteria

Given workplace situations, the learner must demonstrate the use of conductor stringing equipment in the workplace. Employer assessment of performance is required for each task.

Line (GAC): G RIGGING

Competency: G5 Use rigging tools and equipment in transmission, construction and maintenance

Objectives

To be competent in this area, the individual must be able to:

- Identify and describe lifting equipment, resources and components for transmission lines.
- Use lifting components involved in transmission.

LEARNING TASKS	CONTENT
1. Identify hardware, equipment, tackle and slings used in standard rigging practices for transmission	• Shackles and hooks • WLL and size stamps • Chains and slings
2. Identify slinging methods for transmission lines	• Rigging equipment
3. Calculate weights and forces	• Rigging calculations • Rigger's handbook • Manufacturers' and engineering specifications • Load weights of transmission conductors • Manufacturers' UTS

Achievement Criteria

Performance — The learner will:

- Apply rigging theory
- Select appropriate rigging

Conditions — In a lab setting as part of a practical project

Criteria — The learner will be evaluated on:

- Care and maintenance of equipment
- Use of rigging
- Accuracy of applied theory

Line (GAC): G RIGGING

Competency: G6 Perform live line transmission rigging

Objectives

To be competent in this area, the individual must be able to:

- Describe the procedures and equipment used in live line transmission rigging.
- Perform live line rigging.

LEARNING TASKS	CONTENT

1. Describe rigging tasks	• Tool selection
	• Voltages and structures
	  ○ 138 kV timber change
	  ○ 230 kV dead end insulator change
	  ○ 138 kV wish bone timber change
	  ○ 138 kV medium angle insulator string change

2. Calculate weights and forces	• Calculate the weights and forces
	• Voltages and structures
	  ○ 138 kV timber change
	  ○ 230 kV dead-end insulator change
	  ○ 138 kV wish bone timber change
	  ○ 138 kV medium angle insulator string change

3. Demonstrate rigging	• Voltages and structures
	  ○ 138 kV timber change
	  ○ 230 kV dead end insulator change
	  ○ 138 kV wish bone timber change
	  ○ 138 kV medium angle insulator string change

Achievement Criteria

Performance — The learner will:
- Apply rigging theory
- Select appropriate rigging

Conditions — In a lab setting as part of a practical project.

Criteria — The learner will be evaluated on:
- Care and maintenance of equipment
- Use of rigging
- Accuracy of applied theory

Workplace Achievement Criteria

Given workplace situations, the learner must be able to use tools and procedures to perform live line work transmission rigging. Employer assessment of performance and logbook entry is required for each task.

Line (GAC): I UNDERGROUND DISTRIBUTION (UD)

Competency: I4 Operate underground distribution electrical apparatus

Objectives

To be competent in this area, the individual must be able to:

- Operate underground distribution electrical apparatus.

LEARNING TASKS	CONTENT
1. Describe operation of underground electrical apparatus distribution	• Installation procedures for underground distribution (UD) switching apparatus • Operation of underground (UD) switching apparatus • Maintenance procedures for underground distribution (UD) switching apparatus
2. Install switches	• VISTAS/SF6 switching kiosks • Vacuum interruptors • Live fronts • Dead fronts
3. Demonstrate underground distribution switching	• VISTAS/SF6 switching kiosks • Vacuum interruptors • Live fronts • Dead fronts

Achievement Criteria

Performance	The learner will: • Operate underground apparatus • Use specialized PPE/tools
Conditions	In a lab setting as part of a practical project.
Criteria	The learner will be evaluated on: • Safety • Sequence • Use of PPE/tools

Workplace Achievement Criteria

Given workplace situations, the learner must install various electrical apparatus involved in underground distribution. Employer assessment of performance is required for each task.

Line (GAC): J TRANSMISSION

Competency: J1 Describe transmission materials

Objectives

To be competent in this area, the individual must be able to:

- Describe materials used in transmission.

LEARNING TASKS	CONTENT
1. Describe pole/structure materials	• Wood ○ Pole classes • Steel

2. Identify materials and hardware for wood pole transmission lines	• Voltage and structures
	  ○ 60 kV triangular construction
	  ○ 138 kV wishbone construction

3. Identify material and hardware for steel/aluminum structure transmission lines	• Voltage and structures
	  ○ 230 kV – guyed Y
	  ○ 500 kV self supporting A

4. Identify suspension and dead-ending material	• Suspension and dead-ending material and hardware
5. Identify insulator types	• Pin • Post • Ball & socket • kV, kg rating
6. Identify types and sizes of conductors used for transmission line voltages	• Aluminium conductor steel reinforced (ACSR) • Aluminium alloy conductor (AAC)
7. Identify types of connectors, sleeves	• Compression • Bolted
8. Identify wire dead-end material	• Clamps • Compression
9. Identify cellular sites	• Cellular infrastructure

Line (GAC): J TRANSMISSION

Competency: J2 Construct transmission lines

Objectives

To be competent in this area, the individual must be able to:

- Construct transmission lines.

LEARNING TASKS	CONTENT
1. Describe transmission line design	• Basic survey equipment • Job plan • Structure Data Sheets (SDS) • Construction drawings • Identify crossings (road or rail)
2. Describe equipment	• Digging pole holes (proper depth etc.) • Pole setting with line truck, crane truck or other equipment • Setting of poles by helicopter • Helicopter operation • Installation of rider poles
3. Apply grounding and equi-potential bonding principles	• Arc reach • Pole-band transitioning • Grounding site • Bonding zone • Monitoring
4. Construct transmission structures	• Framing structures • Setting structures • Erecting structures • Conductor installation

Achievement Criteria

Performance	The learner will: • Use methods of construction for overhead transmission lines
Conditions	In a lab setting as part of a practical project
Criteria	The learner will be evaluated on: • Select materials • Follow specifications/standards • Safely construct overhead transmission lines

Workplace Achievement Criteria

Given workplace situations, the learner must construct transmission lines as per protocol. Employer assessment of performance is required for each task.

Line (GAC): J TRANSMISSION

Competency: J3 Maintain transmission lines

Objectives

To be competent in this area, the individual must be able to:

- Describe overhead maintenance procedures.
- Perform overhead transmission maintenance procedures.

LEARNING TASKS	CONTENT

1. Describe inspection methods	• Public safety checks
	• Structure and site inspections
	  ○ Structure
	  ○ Insulator
	  ○ Anchor

2. Perform overhead transmission maintenance	• Structure changes
	  ○ Pole structure
	  ○ Steel lattice
	  ○ Guying and anchoring
	• Insulator and line hardware change
	  ○ Spacers
	  ○ Armor rod
	  ○ Dampeners
	  ○ Timber or X-arm changes
	• Conductor
	  ○ Splicing
	  ○ Patch rod
	  ○ Dead-ending

Achievement Criteria

Performance — The learner will:
- Use methods of construction for overhead transmission lines

Conditions — In a lab setting as part of a practical project.

Criteria — The learner will be evaluated on:
- Select materials
- Follow specifications/standards
- Safely construct overhead transmission lines

Workplace Achievement Criteria

Given workplace situations, the learner must maintain transmission lines as per protocol. Employer assessment of performance is required for each task.

Line (GAC): J TRANSMISSION

Competency: J4 Operate transmission electrical apparatus

Objectives

To be competent in this area, the individual must be able to:

- Operate transmission electrical apparatus.

LEARNING TASKS	CONTENT
1. Describe operation of transmission electrical apparatus	• Gang-operated air brake switches • Supervisory-controlled equipment • Ground switches • Capacitor stations • Submarine and underground transmission cable • Grid interconnections

Achievement Criteria

Performance	The learner will: • Operate overhead transmission apparatus • Use specialized PPE/tools
Conditions	In a lab setting as part of a practical project.
Criteria	The learner will be evaluated on: • Safety • Sequence • Use of PPE/tools

Workplace Achievement Criteria

Given workplace situations, the learner must install, operate and maintain electrical apparatus for transmission as per protocol. Employer assessment of performance is required for each task.

Line (GAC): K COMMUNICATION

Competency: K1 Plan tailboard meetings

Objectives

To be competent in this area, the individual must be able to:

- Lead a complex tailboard meeting.

LEARNING TASKS	CONTENT
1. Plan and prepare a tailboard meeting	• Crew duties • Crew complement, qualifications and experience • Sequence and schedule of work • Hazard identification and risk assessment • Safety procedures • Tooling and equipment requirements • Weights and forces calculations • Limits of approach
2. Execute and debrief tailboard meetings	• Potential hazard assessment • Work methods • Communication • Monitoring job progress • Task assignments

Achievement Criteria

Performance	The learner will: • Complete and present tailboard forms • Engage crew in discussion
Conditions	In a lab setting as part of a practical project.
Criteria	The learner will be evaluated on: • Job specifications • Hazard identification and mitigation • Written and oral communication

Workplace Achievement Criteria

Given workplace situations, the learner must be able to plan, prepare and lead tailboard meetings as needed a in the workplace.

Level 4

Powerline Technician

Line (GAC): E ELECTRICAL THEORY

Competency: E6 Describe system operation and protection

Objectives

To be competent in this area, the individual must be able to:

- Describe system operation and protection.

LEARNING TASKS	CONTENT

1. Describe substation operation	• Main components of substations
	  ○ Circuit breakers
	  ○ Bus bar arrangements
	• Simple substation schematics
	• Station service

2. Describe system protection	• Co-ordination
	  ○ Fuses
	  ○ Circuit breakers
	  ○ Reclosers
	  ○ Sectionalizer
	• Arrestors
	• Fault indicators
	• Reactors

3. Describe system operation	• Field switching
	  ○ Radial
	  ○ Looped
	  ○ Overhead
	  ○ Underground
	• Paralleling feeders
	  ○ Looped

4. Describe recloser operation	• Time delay • Protection schemes • Switching • Configurations

Line (GAC): E ELECTRICAL THEORY

Competency: E7 Perform system switching

Objectives

To be competent in this area, the individual must be able to:

- Perform system switching.

LEARNING TASKS	CONTENT

1. Perform switching	• Electrical utility print reading
	• Field switching order requirements
	  ○ Overhead
	  ○ Underground
	• Transfer bus
	• Fused-switch operation and coordination
	• Isolation or de-energization devices
	• Gang-operated air-break switches
	• Single solid-blade disconnects
	• Field pot-head disconnects and sectionalizers
	• Load and non-load break switches and cut-outs
	• Paralleling feeders

Achievement Criteria

Performance	The learner will: • Use single-line diagrams to create a switching plan • Prepare and communicate switching orders • Operate apparatus
Conditions	In a lab setting as part of a practical project.
Criteria	The learner will be evaluated on: • Written and verbal communication • Safety • Accuracy • Use of specialized PPE/tools

Line (GAC): E ELECTRICAL THEORY

Competency: E8 Operate voltage regulators and capacitors

Objectives

To be competent in this area, the individual must be able to:

- Operate voltage regulators.
- Operate capacitors.

LEARNING TASKS	CONTENT

1. Describe voltage regulators	• Voltage regulator construction
	  ○ Bridging reactor
	  ○ Steps/taps
	  ○ Bandwidth hi/low
	• Types and ratings
	  ○ Bi-directional

2. Describe capacitors	• Characteristics
	  ○ Power factor correction
	  ○ Switching
	  ○ Grounding
	• Field capacitor types
	  ○ Fused capacitors
	  ○ Switch capacitors

3. Operate voltage regulators	• Installation • Removal • By-passing • Maintenance ○ Switching
4. Operate capacitors	• Installation • Removal • Maintenance ○ Switching

Achievement Criteria

Performance — The learner will:
- Operate regulators
- Test capacitors

Conditions — In a lab setting as part of a practical project.

Criteria — The learner will be evaluated on:
- Switching sequence
- Tool selection
- Safety

Line (GAC): F EQUIPMENT

Competency: F3 Use stringing equipment

Objectives

To be competent in this area, the individual must be able to:

- Use stringing equipment.

LEARNING TASKS	CONTENT
1. String conductors	• Tension stringing • Non-tension stringing • Sagging • Reeling out of conductors • Conductor splicing • Double socking • Setting up puller and tension sites

2. Use stringing tools and equipment	• Reel trailers
	• Wire tensioners
	• Pullers
	• Stringing sheaves and blocks
	• Pilot/finger lines
	• Pulling lines
	• Pulling line accessories
	  ○ Swivels
	  ○ Kellum grips
	  ○ Clevis
	• Equi-potential grounding & bonding

Workplace Achievement Criteria

Given information on workplace situations, the learner must identify, describe and use stringing tools and equipment in the workplace. Employer assessment of performance is required for each task.

Line (GAC): H OVERHEAD DISTRIBUTION (OD)

Competency: H6 Maintain three-phase distribution lines

Objectives

To be competent in this area, the individual must be able to:

- Describe high-voltage rubber glove methods.
- Perform high-voltage rubber glove methods.

LEARNING TASKS	CONTENT

1. Describe high-voltage rubber glove methods	• Testing
	  ○ Cover-up
	  ○ Gloves
	  ○ Truck
	• Second-point contact
	• Use of FRPs
	• Procedures
	  ○ Conductor splicing
	  ○ Insulator replacement

2. Perform high-voltage rubber glove methods	• Testing
	  ○ Cover-up
	  ○ Gloves
	  ○ Truck
	• Second-point contact
	• Use of FRPs
	• Procedures
	  ○ Conductor splicing
	• Insulator replacement

Achievement Criteria

Performance — The learner will:

- Use rubber glove equipment
- Calculate weights and forces
- Maintain limits of approach
- Perform live line work procedures

Conditions — In a lab setting as part of a practical project.

Criteria — The learner will be evaluated on:

- Safety
- Accuracy of calculations
- Safe work practices
- Care and use of equipment
- Equipment selection

Line (GAC): H OVERHEAD DISTRIBUTION (OD)

Competency: H7 Operate overhead distribution (OD) electrical apparatus

Objectives

To be competent in this area, the individual must be able to:

- Operate overhead distribution electrical apparatus.

LEARNING TASKS	CONTENT
1. Operate overhead distribution electrical apparatus	• Gang-operated air brake switches • Circuit reclosers • Sectionalizers • Capacitors • Voltage regulators • Circuit breakers • Supervisory-operated switches

Achievement Criteria

Performance	The learner will: • Operate overhead apparatus • Use specialized PPE/tools
Conditions	In a lab setting as part of a practical project.
Criteria	The learner will be evaluated on: • Safety • Sequence • Use of PPE/tools

Line (GAC): H OVERHEAD DISTRIBUTION (OD)

Competency: H8 Troubleshoot overhead distribution system components

Objectives

To be competent in this area, the individual must be able to:

- Troubleshoot overhead distribution system components.

LEARNING TASKS	CONTENT

1. Identify causes of trouble	• Common causes of trouble
	  ○ Weather
	  ○ MVA
	  ○ Animal/birds
	  ○ Equipment failure

2. Describe troubleshooting process	• One line diagrams and local maps • Area/location of trouble • Area/customers affected • Switching locations • Grounding procedures • Line patrol

Workplace Achievement Criteria

Given workplace situations, the learner must perform trouble shooting procedures on System Components. Employer assessment of performance is required for each task.

Line (GAC): I UNDERGROUND DISTRIBUTION (UD)

Competency: I5 Troubleshoot underground distribution system components

Objectives

To be competent in this area, the individual must be able to:

- Troubleshoot overhead distribution system components.

LEARNING TASKS	CONTENT
1. Identify causes of trouble	• Dig-ins • Equipment failure • Weather • MVA
2. Describe troubleshooting process	• One-sline diagrams and local maps • Area/location of trouble • Area/customers affected • Switching locations • Grounding procedures • Fault location

Workplace Achievement Criteria

Given workplace situations, the learner must perform trouble shooting procedures on System Components. Employer assessment of performance is required for each task.

Line (GAC): J TRANSMISSION

Competency: J3 Maintain transmission lines

Objectives

To be competent in this area, the individual must be able to:

- Describe bare hand methods.

LEARNING TASKS	CONTENT

1. Describe bare hand methods	• Testing
	  ○ Suit
	  ○ Truck
	• Second-point contact
	• Access methods
	• Use of FRPs

Line (GAC): J TRANSMISSION

Competency: J5 Troubleshoot overhead transmission system components

Objectives

To be competent in this area, the individual must be able to:

- Troubleshoot overhead transmission system components.

LEARNING TASKS	CONTENT

1. Identify causes of trouble	• Common causes of trouble
	  ○ Weather
	  ○ MVA
	  ○ Animal/birds
	  ○ Equipment failure

2. Describe troubleshooting process	• One line diagrams and local maps • Area/location of trouble • Area/customers affected • Switching locations • Grounding procedures • Line patrol

Workplace Achievement Criteria

Given workplace situations, the learner must perform trouble shooting procedures on System Components. Employer assessment of performance is required for each task.

Line (GAC): K COMMUNICATION

Competency: K6 Apply mentoring techniques

Objectives

To be competent in this area, the individual must be able to:

- Describe mentoring techniques.
- Apply mentoring techniques.

LEARNING TASKS	CONTENT
1. Describe mentoring techniques	• Listening skills • Questioning skills • Body language • Coaching • Written directions • Trade terminology

2. Apply mentoring techniques	• Interpersonal skills
	  ○ Encouragement
	  ○ Explaining
	  ○ Following up
	  ○ Demonstrating
	  ○ Leading by example
	  ○ Respect for others
	• Professionalism
	  ○ Time management
	  ○ LEAN management principles
	  ○ Punctuality
	  ○ Respect for authority
	  ○ Stewardship of materials
	• Constructive feedback
	  ○ Apprentice documentation
	• Customers (layperson terms)
	• Employer representation
	• Identify learning needs
	• Teaching techniques
	  ○ Patience
	  ○ Clear explanations
	  ○ Linking lessons
	  ○ Allow practice

Section 4

ASSESSMENT GUIDELINES

Assessment Guidelines – Level 1

Level 1 Grading Sheet: Subject Competency and Weightings

PROGRAM: IN-SCHOOL TRAINING:	Powerline Technician LEVEL 1		
LINE	**TRAINING TOPICS**	**THEORY WEIGHTING**	**PRACTICAL WEIGHTING**
A	SAFETY AND SAFE WORK PRACTICES	17%	14%
B	CLIMBING	12 %	14%
C	POLICIES AND REGULATIONS	8%	0%
D	TOOLS AND INSTRUMENTS	9%	14%
E	ELECTRICAL THEORY	15%	16%
F	EQUIPMENT	0%	9%
G	RIGGING	10%	5%
H	OVERHEAD DISTRIBUTION (OD)	16%	14%
I	UNDERGROUND DISTRIBUTION (UD)	8%	0%
K	COMMUNICATION	5%	14%
	Total	100%	100%
Calculated by the Training Provider Powerline Technician in-school theory & practical subject competency weighting		60%	40%
Training Provider enters final in-school mark into SkilledTradesBC Portal		X%	

Calculated by SkilledTradesBC: In-school Mark SkilledTradesBC Portal calculates the percentage weighting once the in-school mark is entered. Combined theory and practical subject competency multiplied by	80%
Calculated by SkilledTradesBC: Standard Level Exam Mark SkilledTradesBC Portal will calculate the percentage weighting once the standard level exam marks have been entered. The exam score is multiplied by	20%
Calculated by SkilledTradesBC: Final Mark The final mark for determining credit is calculated by SkilledTradesBC Portal.	FINAL%

Assessment Guidelines – Level 2

Level 2 Grading Sheet: Subject Competency and Weightings

PROGRAM: IN-SCHOOL TRAINING:	Powerline Technician LEVEL 2		
LINE	**TRAINING TOPICS**	**THEORY WEIGHTING**	**PRACTICAL WEIGHTING**
D	TOOLS AND INSTRUMENTS	9%	8%
E	ELECTRICAL THEORY	22%	8%
G	RIGGING	16%	20%
H	OVERHEAD DISTRIBUTION (OD)	24%	27%
I	UNDERGROUND DISTRIBUTION (UD)	21 %	23%
K	COMMUNICATION	8%	14%
	Total	100%	100%
Calculated by the Training Provider Powerline Technician in-school theory & practical subject competency weighting		60%	40%
Training Provider enters final in-school mark into SkilledTradesBC Portal		X%	

Calculated by SkilledTradesBC: In-school Mark SkilledTradesBC Portal calculates the percentage weighting once the in-school mark is entered. Combined theory and practical subject competency multiplied by	80%
Calculated by SkilledTradesBC: Standard Level Exam Mark SkilledTradesBC Portal will calculate the percentage weighting once the standard level exam marks have been entered. The exam score is multiplied by	20%
Calculated by SkilledTradesBC: Final Mark The final mark for determining credit is calculated by SkilledTradesBC Portal.	FINAL%

Assessment Guidelines – Level 3

Level 3 Grading Sheet: Subject Competency and Weightings

PROGRAM: IN-SCHOOL TRAINING:	Powerline Technician LEVEL 3		
LINE	**TRAINING TOPICS**	**THEORY WEIGHTING**	**PRACTICAL WEIGHTING**
E	ELECTRICAL THEORY	27%	27%
F	EQUIPMENT	0%	0%
G	RIGGING	29%	18%
I	UNDERGROUND DISTRIBUTION (UD)	16%	23%
J	TRANSMISSION	23%	20%
K	COMMUNICATION	5%	12%
	Total	100%	100%
Calculated by the Training Provider Powerline Technician in-school theory & practical subject competency weighting		50%	50%

Final in-school percentage score Apprentices must achieve a minimum 70% as the final in-school percentage score to be eligible to write the Interprovincial Red Seal or SkilledTradesBC CofQ exam.	IN-SCHOOL %

Assessment Guidelines – Level 4

Level 4 Grading Sheet: Subject Competency and Weightings

PROGRAM: IN-SCHOOL TRAINING:	Powerline Technician LEVEL 4		
LINE	**TRAINING TOPICS**	**THEORY WEIGHTING**	**PRACTICAL WEIGHTING**
E	ELECTRICAL THEORY	30%	30%
F	EQUIPMENT	5%	0%
H	OVERHEAD DISTRIBUTION	30%	40%
I	UNDERGROUND DISTRIBUTION	10%	30%
J	TRANSMISSION	10%	0%
K	COMMUNICATION	15%	0%
	Total	100%	100%
Calculated by the Training Provider Powerline Technician in-school theory & practical subject competency weighting		50%	50%

All apprentices who complete Level 4 of the Powerline Technician program with a FINAL level percentage score of 70% or greater will write the Interprovincial Red Seal examination as their final assessment.

SkilledTradesBC will enter the apprentices' Powerline Technician Interprovincial Red Seal examination percentage score in SkilledTradesBC Portal.

A minimum percentage score of 70% on the examination is required for a pass.

Section 5

TRAINING PROVIDER STANDARDS

Facility Requirements

Classroom Area

- 900 sq. ft. classroom
- 14 networked computer workstations + 1 for the instructor
- Instructional media to include multimedia projector, projection screen, DVD player, flipchart and whiteboard

Indoor Lab Training Area

- 450 sq. ft. for each class
    - Low voltage simulator
    - Primary metering installations
- 900 sq. ft. for each class
    - Underground distribution equipment
    - Cable termination
    - Splicing
- Well heated and ventilated
- Lighting appropriate to detailed work

Outdoor Training Yard

- 3 acres (approx) for a class of 14 students
- Simulated overhead power distribution system
- Simulated overhead power transmission system
- Simulated underground distribution system
- Simulated substation

Instructor's Office Space

- 80 sq. ft. per instructor, with a desk, chairs and materials storage / filing system

Storage

- 800 sq. ft. indoor materials storage
- 5,000 sq. ft. outdoor storage
    - Pole bunks
    - Parking for specialized vehicles and equipment

Tools and Equipment

Hand Tools

Allen keys
Bolt cutters
Broom
Cable cutters
Cable Jacks
Cant hook
Chain jacks
Compression tools (M-D6, Y-35, Y-45, etc.)
Crow bar
Digging bar
Digging spade
Drill bits
Files
Hack saw
Hammers
Knives
Levels
Pliers – nine inch
Pliers – needle-nose
Nut drivers
Peavey
Pick
Plumb bob
Screwdrivers
Shovel
Sledge hammer
Vice
Wire cutters
Wrenches

Personal Protective Equipment

Climbing gear
Face shield
Fire-retardant clothing
Flash glasses
Hard hat and two-point chin strap
Harness to meet WorkSafeBC regulations
Hearing protection
Insulated gloves
Leather gloves
Rubber gloves
Safety glasses
Safety-toe footwear
Safety vest

Safety Equipment

Barricades
Breathing protection
Bucket / tower rescue and descent equipment
Caution tape
Cones
Confined space evacuation equipment
Fire blankets
Fire extinguisher
First-aid equipment
Fume and toxic gas detector
Grounding devices
Grounding mat
Insulated gloves
Life lines
Plastic line guards
Plastic pole guards
Pole-top rescue equipment
Rescue devices
Rubber protective cover-up
Wheel chocks

Live Line Tools

Auxiliary arm and insulators
By-pass jumper
Cut-out covers
Elbow puller
Hot sticks-clamp, grip all, P-2
Insulated web hoist
Insulator support
Live line cutters
Load break tool
Rubber blankets
Rubber hoses/cover up
Spiral link sticks
Sticks and attachments

Electrical Measuring Equipment

Cable identifier
Continuity tester
Current leakage meter
Energized insulator tester
Ground resistance tester
High-voltage phasing sticks
Megger
Ohm meter
Potential testing meter
Rotation meter
Transformer tester
Voltage/amp meters
- Digital and analog

Power Tools

Battery drill
Chain saw
Gas drill
Hydraulic cutters
Hydraulic drill
Hydraulic/electric press (Y-35, Y-45)
Hydraulic ground rod pounder
Portable generator

Specialty Tools and Equipment

Cable locator
Cable stripper
Powder-actuated tool
Feed through device
Gaff gauge
Ground rod driver
Infrared gun
Insulated telescopic (40 ft.) work stick
Reel jacks
Running ground
Silicon cloth

Aerial Work Platforms

Fibreglass ladders
Insulated pole platform (diving board)
Material Handling Aerial Device (MHAD)

Rigging, Hoisting and Lifting Equipment

Block and tackle
Boom truck (RBD)
Capstan hoist
Dynamometer
Hand line
Hoists
Pole jack (butt puller)
Slings / grips
Kellum grip

Communication Equipment

Cellular phone
Computer
Fax machine
Pager
Printer
Telephone
Two-way radio

Reference Materials

The following list of textbooks and learning materials may be needed to enhance the technical training component of the Powerline Technician Apprenticeship program.

Required Reference Materials

- WorkSafe BC Regulations Online
- Delmar's Standard Textbook of Electricity – Current Edition; S.L. Delmar, Thompson Delmar Learning
- The Lineworker's Rigging Handbook – Current Edition; Alexander Publications
- Transformation for Live Line Workers – Current Edition; Alexander Publications
- Live Line Work Practices – Current Edition; Alexander Publications
- Underground Distribution – Current Edition; Alexander Publications
- The Lineman's and Cableman's Handbook; Shoemaker and Mack, McGraw Hill
- Field Manual for Powerline Workers; Solman

Recommended Resources

- Distribution Transformer Handbook; Alexander Publications

Instructor Requirements

Occupation Qualification

The instructor must possess:

- Powerline Technician Red Seal certification
- Certifications and qualifications appropriate to the tools, equipment and systems involved in specific lessons or modules
- For specialized topics, an instructor who may not meet the criteria above will have equivalent levels of appropriate certification and experience

Work Experience

A minimum of 2 years of experience working in the industry as a journeyperson.

Instructional Experience and Education

It is preferred that the instructor also possesses one of the following:

- Provincial (BC) Instructor Diploma or completion of a similar Trainer Training / Instructional Methods program, plus
- Demonstrated effectiveness of communication skills, instructional and interpersona

Appendices

Appendix A: Glossary

Baker board	a fiberglass work platform
Bell	suspension or dead-end insulators
Bell wrench	wrench for tightening various square head bolts
Bonding	making a mechanically secure electrical connection between two or more objects to ensure they are at the same potential
Buck	to lower or attempt to lower the voltage
Buck arm	two sets of crossarms at 90 degree angles to each other.
Bucket truck	an aerial lift truck for raising workers high enough to work on lines from the insulated bucket of the truck
Bug	a transformer
Bull line	heavy line for pulling in wires
Bull wheel	a reel device used to hold tension on a transmission conductor during stringing operations
Bundle	multiple strings of conductor
Capacitor	device that improves power quality
Cascade lighting	method of switching street lights in the first circuit, which, upon being energized, activates a relay that, in turn, energizes the second; the second then energizes the third, and so on
Chicken wing	steel post insulator standoff
Cold	a de-energized line
Conductor	that part of a cable, overhead line or apparatus intended to conduct the flow of electrical energy
Counterpoise	method of bonding, either to ground or to each other
Cribbing	method of increasing pole stability in poor soil conditions
D.A. Bolt	double arming bolt
De-energized	disconnected from a source of electricity
Diaper pin	a clamp to hold rubber blankets
Digging bar	long, round steel bar with 2-in. chisel on one end
Distribution system	operating system which deliver energy from substation to customers and generally operates between 2400 volts to 34,500 volts
Diving board	a platform board (see also 'baker board')
Door	the fuse tube on open type cutouts
Elbow	underground cable terminator
Electrical apparatus	an appliance or device related to power systems
Energized	connected to a source of electricity
Fault indicators	device which indicates a defect or abnormal condition on the system
Fibreglass reinforced	insulated live-line tools; also known as hot stick

plastic (FRP) tool	
Footing	concrete or grillage support for a structure; the base
Gin	temporary lifting device; also known as pole gin or transformer gin
Grillage	buried portion of a steel tower acting as a footing
Grounding	placing interconnected parts at ground/earth potential
Guy wires	high tensile steel wire attached to an anchor point which is installed to offset a conductor tension and equipment load
Half-power	partial/part power to a service
Hard line	steel bull line for pulling in wires
Headache	1) vocal warning of danger. 2) anything falling from above on pole.
High pot	to apply high potential to electrical machine or equipment, normally done during insulation testing.
Hood	insulator cover
Hooks	climbers, used for climbing poles
Hose	rubber or plastic cover up equipment (conductor cover)
Hot	a live or energized line
House knob	a wire holder (also known as an Emily knob)
Hydro-vacuum excavation	excavating with high-pressure water and a vacuum system
Isolated	physically disconnected or separated from all sources of dynamic energy
Jack straps	small (2-in.) blocks for pulling up small wire secondary
Johnny-ball	guy strain insulator
Jumper	a slack electrical connection between two points
Jumper holding stick	wire holding stick
Laminated poles	poles made of laminated wood
Lock-out and tag-out	procedure to prevent unauthorized operation of equipment
Maintenance programs	preventative or pro-active programs to ensure reliability of system
Meggering	to apply potential to test electrical equipment for continuity and insulation
Metering equipment	equipment used to track customer consumption of electricity for billing purposes
Network systems	connecting points of generation or supply sources
Nomenclature	powerlines and electrical apparatus designated by alphabetic and numeric codes
Nose bag	canvas tool pouch
Phase	one (single) conductor
Pig-tail	spiral disconnect or spiral link stick
Ping	deformation of threads to prevent nuts from loosening due to vibration

Potential	latent energy (potential presence of voltage)
Powder-actuated tools	tools that requires an explosive charge to operate
Pothead	the termination device used on end of an underground cable
Primary	voltage above 751 volts alternating current (distribution system)
Reactor	equipment that stabilizes over-voltage conditions
Riser pole	a transition pole going from overhead to underground distribution (also known as 'dip pole')
Secondary	voltage 750 volts alternating current, and below (distribution system)
Sectionalize	to isolate or separate sections of line
Sheaves	part of a rope block
Shot gun stick	a Grip-All stick
Skywire	a ground wire on top of poles and towers to protect the lines from lightning; also known as shield wire, static wire or overhead shield wire (OHSW)
Sleeve	a splice
Splicing	the joining of two conductors together end to end
Standards	local or utility-based structural designs
Structure	a device used to support conductors or cables and related equipment; for example, poles and towers
Switch stick	a disconnect stick
Tag line	rope used to tie off line or to control load being lifted
Thumper	underground fault locator
Tongs	usually refer to pole tongs, used for controlling pole when setting
Thru-bolt	a machine bolt
Spoon	a shovel; cup-shaped with long handle
Squeeze on	a compression fitting (connectors). Also known as a 'crimp-it'
Line guard	plastic protective cover
Switching	an operation that affects or modifies the status of a system
Transformer 'bank'	two or three transformers at same location connected to the same circuit
Transmission line	operating voltage over 35,000 volts
Transmission system	operating system with a voltage between 69,000 volts to 765,000 volts
Tree	pole mounted auxiliary arm used for lifting conductors
Weatherhead	the top of the conduit that contains the customer service conductors, constructed so it will resist the action of rain, sun, etc.

Appendix B: Acronyms

AAC	Aluminum Alloy Conductor
AR	Arc Rated (note: all AR clothing is flame resistant (FR), but not all FR clothing has been Arc Rated)
ACSR	Aluminum conductor steel reinforced
CCA	chromated copper arsenates (pole treatment material)
C.S.P.	completely self-protected transformer
C.T.	current transformer, a device used to transfer current from one value to another
FR	Flame Resistant (note: all AR clothing is flame resistant (FR), but not all FR clothing has been Arc Rated).
FRC	flame retardant clothing
FRP	fibreglass reinforced plastic (hotline sticks)
GIS	Geographical Information System
GPS	Global Positioning System
KVA	kilovolt ampere
LED	light emitting diode
OD	Overhead Distribution
O.C.B.	oil circuit breaker
OH&S	Occupational Health and Safety
P.C.B.	polychlorinated biphenyl chemical
PPE	personal protective equipment
P.T.O.	power take off
RBD	radial boom derricks
SF6	Sulphur hexafluoride gas
SWL	Safe working load
TDG	Transportation of Dangerous Goods
ULF	Ultra low frequency
URD	Underground Residential/Rural Distribution
UD	Underground Distribution
VLF	Very low frequency
WHMIS	Workplace Hazardous Materials Information System
WLL	working load limit