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# Plan of Training

## POWERLINE TECHNICIAN (OPERATING)



Government of Newfoundland and Labrador  
Department of Education  
Institutional and Industrial Education Division

MAY 2010

# PLAN OF TRAINING

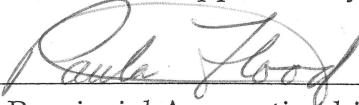
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May 2010



Government of Newfoundland and Labrador  
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Approved by:

  
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Chairperson, Provincial Apprenticeship and Certification Board

Date: May 18, 2010

## Preface

This Apprenticeship Standard is based on the 2009 edition of the National Occupational Analysis for the Powerline Technician trade.

This document describes the curriculum content for the Powerline Technician (Operating) apprenticeship training program and outlines each of the technical training units necessary for the completion of apprenticeship.

## Acknowledgements

Advisory committees, industry representatives, instructors and apprenticeship staff provided valuable input to the development of this Apprenticeship Curriculum Standard. Without their dedication to quality apprenticeship training, this document could not have been produced.

We offer you a sincere thank you.

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## **A. Conditions Governing Apprenticeship Training**

### **1.0 General**

The following general conditions apply to all apprenticeship training programs approved by the Provincial Apprenticeship and Certification Board (PACB) in accordance with the *Apprenticeship Training and Certification Act (1999)*. If an occupation requires additional conditions, these will be noted in the specific Plan of Training for the occupation. In no case should there be a conflict between these conditions and the additional requirements specified in certain Plan of Training.

### **2.0 Entrance Requirements**

2.1 Entry into the occupation as an apprentice requires:

Indenturing into the occupation by an employer who agrees to provide the appropriate training and work experiences as outlined in the Plan of Training.

2.2 Notwithstanding the above, each candidate must have successfully completed a high school program or equivalent, and in addition may be required to have completed certain academic subjects as specified in particular Plan of Training. Mature students, at the discretion of the Director of Institutional and Industrial Education, may be registered. A mature student is defined as one who has reached the age of 19 and who can demonstrate the ability and the interest to complete the requirements for certification.

2.3 At the discretion of the Director of Institutional and Industrial Education, credit toward the apprenticeship program may be awarded to an apprentice for previous work experience and/or training as validated through prior learning assessment.

2.4 An Application for Apprenticeship form must be duly completed.

### **3.0 Probationary Period**

The probationary period for each Memorandum of Understanding will be six months. Within that period the memorandum may be terminated by either party upon giving the other party and the PACB one week notice in writing.

### **4.0 Termination of a Memorandum of Understanding**

After the probationary period referred to in Section 3.0, the Memorandum of Understanding may be terminated by the PACB by mutual consent of the parties involved, or cancelled by the PACB for proper and sufficient cause in the opinion of the PACB.

### **5.0 Apprenticeship Progression Schedule and Wage Rates**

#### **5.1 Progression Schedule**

<b>7200 Hour Programs</b>	<b>Requirements for Progression</b>	<b>Progress To</b>
First Year Apprentice	Completion of entry level (Block 1) courses, plus relevant work experience totaling a minimum of 1800 hours *	Second Year
Second Year Apprentice	Completion of advanced level (Block 2) courses, plus relevant work experience totaling a minimum of 3600 hours	Third Year
Third Year Apprentice	Completion of advanced level (Block 3) courses, plus relevant work experience totaling a minimum of 5400 hours	Fourth Year
Fourth Year Apprentice	Completion of advanced level (Block 4) courses and (Blocks 5 & 6) <i>if applicable</i> , plus sign-off of workplace skills required for certification totaling a minimum of 7200 hours**	Write Certification Examination

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<b>5400 Hour Programs</b>	<b>Requirements for Progression</b>	<b>Progress To</b>
First Year Apprentice	Completion of entry level (Block 1) courses, plus relevant work experience totaling a minimum of 1800 hours *	Second Year
Second Year Apprentice	Completion of advanced level (Block 2) courses, plus relevant work experience totaling a minimum of 3600 hours	Third Year
Third Year Apprentice	Completion of advanced level (Block 3) courses, plus sign-off of workplace skills required for certification totaling a minimum of 5400 hours	Write Certification Examination

<b>4800 Hour Programs</b>	<b>Requirements for Progression</b>	<b>Progress To</b>
First Year Apprentice	Completion of entry level courses (Block 1) courses, plus relevant work experience totaling a minimum of 1600 hours *	Second Year
Second Year Apprentice	Completion of advanced level (Block 2) courses, plus relevant work experience totaling a minimum of 3200 hours	Third Year
Third Year Apprentice	Completion of advanced level (Block 3) courses, plus sign-off of workplace skills required for certification totaling a minimum of 4800 hours	Write Certification Examination

\* All direct entry apprentices must meet the **Requirements for Progression** either through Prior Learning Assessment and Recognition or course completion before advancing to the next year.

\*\* Apprentices in a 7200 hour program which incorporates more than four blocks of training are considered fourth year apprentices pending completion of 100% course credits and workplace skills requirements.

- 5.2 For the duration of each Apprenticeship Training Period, the apprentice who is not covered by a collective agreement, shall be paid a progressively increased schedule of wages.

Program Duration	Wage Rates		Comments
7200 Hours	1 <sup>st</sup> Year	60%	These wage rates are percentages of the prevailing journeyperson's wage rate in the place of employment of the apprentice. No apprentice shall be paid less than the wage rate established by the Labour Standards Act (1988), as now in force or as hereafter amended, or by other Order, as amended from time to time replacing the first mentioned Order.
	2 <sup>nd</sup> Year	70%	
	3 <sup>rd</sup> Year	80%	
	4 <sup>th</sup> Year	90%	
5400 Hours and 4800 Hours	1 <sup>st</sup> Year	60%	These wage rates are percentages of the prevailing journeyperson's wage rate in the place of employment of the apprentice. No apprentice shall be paid less than the wage rate established by the Labour Standards Act (1988), as now in force or as hereafter amended, or by other Order, as amended from time to time replacing the first mentioned Order.
	2 <sup>nd</sup> Year	75%	
3 <sup>rd</sup> Year			
4000 Hours			(Hairstylist Program) - The apprentice shall be paid no less than the minimum wage for hours worked and a commission agreed upon between the apprentice and the employer.

## 6.0 Tools

Apprentices shall be required to obtain hand tools as and when specified by the PACB.

## 7.0 Periodic Examinations and Evaluation

- 7.1 Every apprentice shall submit to such occupational tests and examinations as the PACB shall direct. If after such occupational tests and examinations the apprentice is found to be making unsatisfactory progress, his/her rate of wage shall not be advanced as provided in Section 5 until his/her progress is satisfactory to the Director of Institutional and Industrial Education and his/her date of completion shall be deferred accordingly. Persistent failure to pass required tests shall be a cause for revocation of his/her Memorandum of Understanding.
- 7.2 Upon receipt of reports of accelerated progress of the apprentice, the PACB may shorten the term of apprenticeship and advance the date of completion accordingly.
- 7.3 For each and every course, a formal assessment is required for which 70% is the pass mark. At the discretion of the instructor, the summative mark may be for

completion of a theory examination or a combination of the theory examination and an assigned practical project.

## **8.0 Granting of Certificates of Apprenticeship**

Upon the successful completion of apprenticeship, the PACB shall issue a Certificate of Apprenticeship

## **9.0 Hours of Work**

Any hours employed in the performance of duties related to the designated occupation will be credited towards the completion of the term of apprenticeship. Appropriate documentation of these hours must be provided.

## **10.0 Copies of the Registration for Apprenticeship**

The Director of Institutional and Industrial Education shall provide copies of the Registration for Apprenticeship form to all signatories to the document.

## **11.0 Ratio of Apprentices to Journeypersons**

The ratio of apprentices to journeypersons shall not exceed two apprentices to every one journeyperson employed, with the condition that one of these be a final year apprentice.

## **12.0 Relationship to a Collective Bargaining Agreement**

Collective agreements take precedence over the conditions outlined in the Plan of Training.

## **13.0 Amendments to a Plan of Apprenticeship Training**

A plan of training may be amended at any time by the PACB.

## **14.0 Employment, Re-Employment and Training Requirements**

### **14.1 The Plan of Training requires apprentices to regularly attend their place of employment.**

- 14.2 The Plan of Training requires apprentices to regularly attend training programs for that occupation as prescribed by the PACB.
- 14.3 Failure to comply with Sections 14.1 and/or 14.2 will result in cancellation of the Memorandum of Understanding. Apprentices may have their MOUs reinstated by the PACB but would be subject to a commitment to complete the entire program as outlined in the General Conditions of Apprenticeship. An apprentice will be required to pay a reinstatement fee. Permanent cancellation in the said occupation is the result of non-compliance.
- 14.4 Cancellation of the Memorandum of Understanding to challenge journeyperson examinations, if unsuccessful, would require an apprentice to serve a time penalty of two (2) years before reinstatement as an apprentice or registering as a Trade Qualifier.
- 14.5 Under the Plan of Training the employer is required to keep each apprentice employed as long as work is available, and if the apprentice is laid off due to lack of work, to give first opportunity to be hired before another is hired.
- 14.6 The employer will permit each apprentice to regularly attend training programs as prescribed by the PACB.
- 14.7 Apprentices who cannot acquire all the workplace skills at their place of employment will have to be evaluated in a simulated work environment at a training institution and have sign-off done by instructors to meet the requirements for certification.

## **15.0 Appeals to Decisions Based on Conditions Governing Apprenticeship Training**

Persons wishing to appeal any decisions based on the above conditions must do so in writing to the Minister of Education within 30 days of the decision.

## **B. Requirements for Red Seal Certification**

1. Evidence that the required work experiences outlined in this plan of training have been obtained. This evidence must be in a format that clearly outlines the experiences and must be signed by an appropriate person or persons attesting that these experiences have been obtained to the level required.
2. Successful completion of all required courses in program.
3. A combination of training from an approved training program and suitable work experience totalling 7200 hours.
4. Completion of a National Red Seal examination, to be set at a place and time determined by the Industrial Training Section.
5. Payment of the appropriate examination fee.

## **C. Roles and Responsibilities of Stakeholders in the Apprenticeship Process**

The apprenticeship process involves a number of stakeholders playing significant roles in the training of apprentices. This section outlines these roles and the responsibilities resulting from them.

### **The Apprentice:**

- completes all required technical training courses as approved by the PACB.
- finds appropriate employment.
- completes all required work experiences in combination with the required hours.
- ensures work experiences are well documented.
- approaches apprenticeship training with an attitude and commitment that fosters the qualities necessary for a successful career as a qualified journeyperson.
- obtains the required hand tools as specified by the PACB for each period of training of the apprenticeship program.

### **The Employer:**

- provides high quality work experiences in an environment conducive to learning.
- remunerates apprentices as set out in the Plan of Training or Collective Agreements.
- provides feedback to training institutions, Institutional and Industrial Education Division and apprentices in an effort to establish a process of continuous quality improvement.

- where appropriate, releases apprentices for the purpose of returning to a training institution to complete the necessary technical courses.
- ensures work experiences of the apprentice are documented.

### **The Training Institution:**

- provides a high quality learning environment.
- provides the necessary student support services that will enhance an apprentice's ability to be successful.
- participates with other stakeholders in the continual updating of programs.

### **The Apprenticeship Division:**

- establishes and maintains program advisory committees under the direction of the PACB.
- promotes apprenticeship training as a viable career option to prospective apprentices and other appropriate persons involved, such as career guidance counsellors, teachers, parents, etc.
- establishes and maintains a protocol with training institutions, employers and other appropriate stakeholders to ensure the quality of apprenticeship training programs.
- ensures all apprentices are appropriately registered and records are maintained as required.
- schedules all necessary technical training periods for apprentices to complete requirements for certification.
- administers provincial/interprovincial examinations.

## **The Provincial Apprenticeship and Certification Board:**

- sets policies to ensure the provisions of the *Apprenticeship and Certification Act* (1999) are implemented.
- ensures advisory and examination committees are established and maintained.
- accredits institutions to deliver apprenticeship training programs.
- designates occupations for apprenticeship training and/or certification.

## **D. Program Outcomes**

Upon completion of the Powerline Technician program, students will have demonstrated the knowledge and skills required to perform the following tasks:

- Task 1      Uses and maintains tools and equipment.
- Task 2      Communicates in the workplace.
- Task 3      Organizes work.
- Task 4      Establishes a safe work environment
- Task 5      Uses live line methods.
- Task 6      Install poles.
- Task 7      Install steel structures.
- Task 8      Installs overhead conductors.
- Task 9      Installs underground and marine cable.
- Task 10     Installs lighting systems.
- Task 11     Installs voltage control equipment.
- Task 12     Installs protection equipment.
- Task 13     Installs metering equipment.
- Task 14     Operates distribution and transmission systems.
- Task 15     Maintains distribution and transmission systems.
- Task 16     Repairs distribution systems.
- Task 17     Repairs transmission systems.

## E. Program Structure

For each and every course, a formal assessment is required for which 70% is the pass mark. At the discretion of the instructor, the summative mark may be for completion of a theory examination or a combination of the theory examination and an assigned practical project.

The order of course delivery within each block can be determined by the educational agency, as long as pre-requisite conditions are satisfied.

Entry Level Courses – Block 1			
Course No.	Course Name	Hours	Pre-Requisites
TS1510	Occupational Health and Safety	6	None
TS1520	WHMIS	6	None
TS1530	Standard First Aid	14	None
OL1630	Orientation to the Trade	20	None
OL1620	Environmental Awareness	4	None
OL1640	Vehicle Familiarization	20	None
OL1610 <sup>a</sup>	Defensive Driving	6	OL1640
OL1660	Basic Hand and Specialty Tools	15	None
OL1670	Basic Power Tools	10	None
OL1650	Powerline Technician Equipment	25	None
ER1140	DC Theory	30	None
ER1150	Series and Parallel Circuits	45	ER1140
ER1180	Single Phase Theory	60	ER1160
OL1680	Chainsaw Familiarization	10	None
OL1830	Customer Service Connections	30	OL1810
OL1700	Interpret Drawings, Specifications, and Standards	10	None
OL1710	Distribution Line Design and Construction 1	70	OL1700
OL1711	Distribution Line Design and Construction 2	70	OL1710

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<b>Entry Level Courses – Block 1</b>			
<b>Course No.</b>	<b>Course Name</b>	<b>Hours</b>	<b>Pre-Requisites</b>
OL1713	Distribution Line Design and Construction 3	60	OL1710
OL1720	Conductors	20	None
OL1730	Conductor Sizes and Measurements	2	OL1720
OL1740	Sagging Conductors	10	OL1730
OL1750	Tree Pruning	6	OL1680
OL1850	Rigging	40	None
OL1690	Pole Safety	10	None
OL1760	Rescue at Heights	30	OL-1640, OL-1650
OL1770	Mobile Hydraulic Training	30	None
OL1600	Traffic Control Person	4	None
OL1780	Transmission Structures	10	None
OL1790	Grounds (Personal Structures and Vehicles)	30	ER-1180
OL1840	Single Phase Revenue Metering	15	ER-1180
OL1820	Street Lighting	30	None
OL1810	Transformers	30	ER1180
AP1100	Introduction to Apprenticeship	15	None
*MA1060	Basic Math	60	None
CM2150	Workplace Communications	45	None
MR1220	Customer Service	30	None
SP2330	Quality Assurance/Quality Control	30	None
MC1050	Introduction to Computers	30	None
SD1700	Workplace Skills	30	None
SD1710	Job Search Techniques	15	None
SD1720	Entrepreneurial Awareness	15	None
OT1160	Work Term	60	None
<b>Total Hours</b>		<b>1108</b>	

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\* A student who can meet the Mathematics requirement through an ACUPLACER online test may be exempted from Mathematics 1060.

<sup>a</sup> All entrants must have a valid class 5 license prior to entry into the Powerline Technician program. Motor Vehicle Regulations require persons to have a valid Class 5 for a minimum of 24 months prior to applying for a Class 3 License.

### Required Work Experience

#### Advanced Level Courses – Block 2

Course No.	Course Name	Hours	Pre-Requisites
OL2510	System Operating Practices	30	Completion of 1 <sup>st</sup> Year Course
OL2520	Three Phase Theory	60	ER1180
OL2530	Transformer Banking	60	ER1190
OL2540	Power Transformers	25	OL2530
OL2550	Paralleling Three Phase Circuits	25	OL2530
OL2560	Single Phase and Three Phase Revenue Metering	10	OL2520
OL2570	Substations, Switching Station and Terminals	30	Completion of 1 <sup>st</sup> year Course
<b>Total Hours</b>		<b>240</b>	

### Required Work Experience

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<b>Advanced Level Courses – Block 3</b>			
<b>Course No.</b>	<b>Course Name</b>	<b>Hours</b>	<b>Pre-Requisites</b>
OL2610	Switches and Protective Devices	30	Completion of Block 2
OL2620	Voltage Regulations	30	Completion of Block 2
OL2631	Underground Construction	65	Completion of Block 2
OL2641	Underground System Operation	65	OL2631
OL2650	Line Capacitors	20	ER1180
OL2660	Electronic Reclosers	30	Completion of Block 2
<b>Total Hours</b>		<b>240</b>	

### Required Work Experience

<b>Advanced Level Courses – Block 4</b>			
<b>NL Course No.</b>	<b>Course Name</b>	<b>Hours</b>	<b>Pre-Requisites</b>
OL2710	Live Line Work (Hot Stick)	120	Completion of Block 3
OL2720	Live Line Work (Rubber Glove)	120	Completion of Block 3
<b>Total Hours</b>		<b>240</b>	

<b>Total Course Credit Hours</b>	<b>1828</b>
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## **Entry Level – Block 1**

### **TS1510      Occupational Health and Safety**

#### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

#### **Description:**

This course is designed to give participants the knowledge and skills necessary to interpret the Occupational Health and Safety Act, laws and regulations; understand the designated responsibilities within the laws and regulations; the right to refuse dangerous work; and the importance of reporting accidents.

#### **Pre-Requisites:**   None

#### **Course Outcomes:**

Upon successful completion of this unit, the apprentice will be able to:

- prevent accidents and illnesses
- improve health and safety conditions in the workplace

#### **Theory:**

1. Interpret the Occupational Health and Safety Act laws and regulations.
  - i. explain the scope of the act
    - application of the act
    - Federal/Provincial jurisdictions
    - Canada Labour Code
    - rules and regulations
    - private home application
    - conformity of the Crown by the Act
2. Explain responsibilities under the Act and Regulations.
  - i. duties of employer, owner, contractors, sub-contractors, employees, and

suppliers

3. Explain the purpose of joint health and safety committees.
  - i. formation of committee
  - ii. functions of committee
  - iii. legislated rights
  - iv. health and safety representation
  - v. reporting endangerment to health
  - vi. appropriate remedial action
  - vii. investigation of endangerment
  - viii. committee recommendation
  - ix. employer's responsibility in taking remedial action
4. Examine right to refuse dangerous work.
  - i. reasonable grounds for refusal
  - ii. reporting endangerment to health
  - iii. appropriate remedial action
  - iv. investigation of endangerment
  - v. committee recommendation
  - vi. employer's responsibility to take appropriate remedial action
  - vii. action taken when employee does not have reasonable grounds for refusing dangerous work
  - viii. employee's rights
  - ix. assigning another employee to perform duties
  - x. temporary reassignment of employee to perform other duties
  - xi. collective agreement influences
  - xii. wages and benefits
5. State examples of work situations where one might refuse work.
6. Describe discriminatory action.
  - i. definition
  - ii. filing a complaint procedure
  - iii. allocated period of time a complaint can be filed with the Commission
  - iv. duties of an arbitrator under the Labour Relations Act
  - v. order in writing inclusion
  - vi. report to commission Allocated period of time to request Arbitrator to deal with the matter of the request
  - vii. notice of application

- viii. failure to comply with the terms of an order
  - ix. order filed in the court
7. Explain duties of commission officers.
- i. powers and duties of officers
  - ii. procedure for examinations and inspections
  - iii. orders given by officers orally or in writing
  - iv. specifications of an order given by an officer to owner of the place of employment, employer, contractor, sub-contractor, employee, or supplier
  - v. service of an order
  - vi. prohibition of persons towards an officer in the exercise of his/her power or duties
  - vii. rescinding of an order
  - viii. posting a copy of the order
  - ix. illegal removal of an order
8. Interpret appeals of others.
- i. allocated period of time for appeal of an order
  - ii. person who may appeal order
  - iii. action taken by Commission when person involved does not comply with the order
  - iv. enforcement of the order
  - v. notice of application
  - vi. rules of court
9. Explain the process for reporting of accidents.
- i. application of act
  - ii. report procedure
  - iii. reporting notification of injury
  - iv. reporting accidental explosion or exposure
  - v. posting of act and regulations

**Practical:**

1. Conduct an interview with someone in your occupation on two or more aspects of the act and report results.
2. Conduct a safety inspection of shop area.

## **TS1520      Workplace Hazardous Materials Information System (WHMIS)**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

### **Description:**

This course is designed to give participants the knowledge and skills necessary to define WHMIS, examine hazard identification and ingredient disclosure, explain labeling and other forms of warning, and introduce material safety data sheets (MSDS).

### **Pre-Requisites:** None

### **Course Outcomes:**

Upon successful completion of this course, the apprentice will be able to:

- interpret and apply the Workplace Hazardous Materials Information System (WHMIS) Regulation under the Occupational Health & Safety Act.

### **Required Knowledge and Skills:**

1. Define WHMIS safety.
  - i. rational and key elements
  - ii. history and development of WHMIS
  - iii. WHMIS legislation
  - iv. WHMIS implementation
  - v. Definitions of legal and technical terms
2. Examine hazard identification and ingredient disclosure.
  - i. prohibited, restricted and controlled products
  - ii. classification and the application of WHMIS information requirements
  - iii. responsibilities for classification
    - the supplier
    - the employer
    - the worker-classification: rules and criteria
    - information on classification

- classes, divisions and subdivisions in WHMIS
  - general rules for classification
  - class A – compresses gases
  - class B – flammable and combustible materials
  - class C – oxidizing material
  - class D – poisonous and infectious material
  - class E – corrosive material
  - class F – dangerously reactive material
- iv. products excluded from the application of WHMIS legislation
- consumer products
  - explosives
  - cosmetics, drugs, foods and devices
  - pest control products
  - radioactive prescribed substances
  - wood or products made of wood
  - manufactured articles
  - tobacco or products of tobacco
  - hazardous wastes
  - products handled or transported pursuant to the Transportation of Dangerous Goods (TDG) Act
- v. comparison of classification systems – WHMIS and TDG
- vi. general comparison of classification categories
- vii. detailed comparison of classified criteria
3. Explain labeling and other forms of warning.
- i. definition of WHMIS label
    - supplier label
    - workplace label
    - other means of identification
  - ii. responsibilities for labels
    - supplier responsibility
    - employer responsibility
    - worker responsibility
  - iii. introduce label content, design and location
    - supplier labels
    - workplace labels
    - other means of identification
4. Introduce material safety data sheets (MSDS).

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- i. definition of a material safety data sheet
- ii. purpose of the data sheet
- iii. responsibility for the production and availability of data sheets
  - supplier responsibility
  - employer responsibility
  - workers responsibility

### **Practical:**

1. Locate WHMIS label and interpret the information displayed.
2. Locate a MSDS sheet for a product used in the workplace and determine what personal protective equipment and other precautions are required when handling this product.

### **SUGGESTED RESOURCES:**

1. WHMIS Regulation.
2. Sample MSDS sheets.

**TS1530      Standard First Aid**

**NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** None

**Description:**

This course is designed to give the apprentice the ability to recognize situations requiring emergency action and to make appropriate decisions concerning first aid.

Complete a **St. John Ambulance or Canadian Red Cross Standard First Aid Certificate** course.

## **OL1610    Defensive Driving**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** OL1640

### **Course outcomes:**

Upon successful completion of this course, the apprentice will:

- develop the skills and knowledge required for the safe operation and maintenance of motorized vehicles

### **Theory:**

1. Complete a Defensive Driving Course.

## **OL1620 Environmental Awareness Course**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** None

### **Course outcomes:**

Upon successful completion of this course, the apprentice will:

- become familiar with environmental issues related to the utility trade

### **Theory:**

1. Identify environmental issues that affect Powerline Technician's work.
2. Explain how an employee's actions can improve the company's environmental performance.
3. Identify typical hazards encountered in performing the duties of a Powerline Technician.
4. Describe procedures used when responding to environment hazards.

## OL1630 Orientation to the Trade

### NOA Reference:

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** None

### Outcomes:

Upon successful completion of this course, the apprentice will:

- be familiar with the expectations of a powerline technician

### Objectives and Content:

1. Describe the overall duties of a Powerline Technician.
  - i. above ground
    - installation
    - maintenance
  - ii. Underground
    - installation
    - maintenance
2. Describe safety hazards involved with being a Powerline Technician.
3. Describe equipment used by Powerline Technicians.
4. List fire safety regulations.
5. Describe the operation and uses of different types of fire extinguishers.

## **OL1640     Vehicle Familiarization**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** None

### **Outcomes:**

Upon successful completion of this course the apprentice will:

- be familiar with line vehicles which are an integral part of the lineman's work

### **Objectives and Content:**

1. Identify types of vehicles used by Powerline Technician.
  - i. radial boom derrick trucks
  - ii. material handlers (on-road & off-road)
  - iii. all terrain vehicles
  - iv. snow mobiles
2. Describe the proper use of a driver log book.
3. Complete an Air Brake Endorsement course.

### **Practical:**

1. Demonstrate ability to perform daily pre-operational checks on vehicles used by powerline technicians.
2. Record daily vehicle driving and operating hours in a logbook.

## **OL1660 Basic Hand and Specialty Tools**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

### **Pre-Requisites:** None

### **Outcomes:**

Upon successful completion of this course, the apprentice will:

- Identify basic hand tools and specialty tools required by Powerline Technicians

### **Theory:**

1. Identify hand tools specific to the powerline technician.
  - i. pliers
  - ii. allen keys
  - iii. brace and bit
  - iv. screwdrivers
  - v. knives
  - vi. hammer
  - vii. wrenches
  - viii. rules
  - ix. hacksaw
  
2. Identify specialty tools specific to the powerline technician.
  - i. cable cutters
  - ii. bolt cutters
  - iii. ratchet cutters
  - iv. cable jack
  - v. chain come-a-long
  - vi. buck saw
  - vii. plumb bob

**Practical:**

1. Use basic hand tools required by Powerline Technicians.

## **OL1670 Basic Power Tools**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

### **Pre-Requisites:** None

### **Outcomes:**

Upon successful completion of this course, the apprentice will:

- Identify basic power tools specific to the powerline technician

### **Theory:**

#### 1. Identify basic power tools specific to the powerline technician.

- i. drills
- ii. electric
- iii. gas
- iv. cordless
- v. hydraulic
- vi. hydraulic/electric press
- vii. jack hammer
- viii. portable generator

### **Practical:**

#### 1. Demonstrate the use of basic power tools specific to the powerline technician.

## **OL1650 Powerline Technician's Equipment**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** None

### **Outcomes:**

Upon successful completion of this course, the apprentice will:

- be able to properly care for and use personal equipment and tools

### **Objectives and Content:**

1. Identify clothing specific to the powerline technician.

- i. boots
- ii. winter footwear
- iii. pants or bib overalls
- iv. other clothing
- v. hard hats
- vi. gloves & mitts
- vii. flame resistant clothing
- viii. hazards provided by jewelry

2. Identify climbing equipment.

- i. fitting the climbers
- ii. inspection and maintenance of climber gaffs (spurs)
- iii. fitting the body belt
- iv. the pad measurement
- v. the belt measurement
- vi. pole strap
- vii. storing climbing tools
- viii. body harness

3. Identify personal protective equipment.

- i. rubber protective equipment
- ii. head protection

- iii. eye protection
- iv. hearing protection

**Practical:**

1. Use and maintain climbing equipment.
2. Perform maintenance on Rubber Protective Equipment.
3. Use basic hotsticks used by the powerline technician.
4. Demonstrate safe climbing practices.
5. Perform hole cut out test.

## **ER1140 DC Theory**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** None

### **Outcomes:**

Upon the successful completion of this unit the apprentice will be able to:

- demonstrate knowledge of direct current circuit theory and the selection and use of measuring instruments

### **Objectives and Content:**

1. Describe the atomic structure of matter.
  - i. electron theory
    - matter
    - atoms
    - electric charge
    - protons, electrons, neutrons
  - ii. static electricity and electrostatics
    - positive and negative charge
    - electrostatic field
    - transferring static electricity
    - conduction
    - induction
    - discharging static charges
  - iii. electrons in motion
    - conductors, insulators
    - electron current flow
    - conventional current flow
2. Identify electrical units and symbols.
  - i. absolute electrical units
  - ii. current
  - iii. voltage

- iv. resistance
  - v. prefixes for absolute units
3. Identify different forms of energy and describe the effects of dynamic electricity.
- i. different forms of energy to produce electricity.
    - chemical action
    - piezoelectric effect
    - magnetism
    - heat
    - light and solar energy
    - friction
    - wind
  - ii. effects of dynamic electricity
    - heating effects
    - chemical effects
    - magnetic effects
    - psychological and physiological effects
4. Describe the procedures used to analyze the components necessary for the assembly of an electric circuit.
- i. the electron path (conductors)
  - ii. the load
  - iii. the source
  - iv. the control
  - v. closed circuit
  - vi. open circuit
  - vii. short circuit
5. Identify and describe the three basic electrical properties.
- i. voltage
  - ii. current
  - iii. resistance
6. Describe the relationship among the three basic electrical properties.
- i. Ohm's Law
7. Describe the relationship between work done and electricity.
- i. work
  - ii. power

- iii. electrical work
  - iv. joules and coulombs
  - v. electrical power (watt)
  - vi. combination of the Power formulas and Ohm's Law
  - vii. watts and horsepower
  - viii. electrical energy
  - ix. energy and BTU
  - x. kilowatt hours
  - xi. meter reading and co
8. Identify measuring instruments and describe their applications and procedures.
- i. ammeter
  - ii. voltmeter
  - iii. ohmmeter
  - iv. multimeter
  - v. circuit tester
  - vi. continuity tester

**Practical:**

1. Demonstrate the use of various meters.

## **ER1150      Series and Parallel Circuits**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** ER1140

### **Outcomes:**

Upon successful completion of this unit the apprentice will be able to:

- determine the absolute values of devices connected in series, parallel or any combination of these two

### **Objectives and Content:**

1. Describe the characteristics of a series circuit.

- i. resistance
- ii. current
- iii. power
- iv. voltage
- v. open resistor
- vi. troubleshooting

2. Calculate series circuit values.

3. Describe the characteristics of a parallel circuit.

- i. resistance
- ii. current
- iii. voltage
- iv. power
- v. open resistor
- vi. shorted resistor
- vii. troubleshooting

4. Calculate parallel circuit values.

5. Explain Kirchhoff's Laws.

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- i. current law
  - ii. voltage law
6. Describe the characteristics of a combination circuit.
  7. Calculate combination circuit values.

## ER1180 Single Phase Theory

### NOA Reference:

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

### Pre-Requisites: ER-1160

### Outcomes:

Upon the successful completion of this unit the apprentice will be able to:

- demonstrate knowledge of the basic concepts of alternating current (AC) and perform calculations

### Objectives and Content:

1. Describe the principles of magnetism and the action of magnets.
  - i. magnetic and nonmagnetic substances categories
    - magnetic and nonmagnetic substances
    - ferromagnetic, diamagnetic, and paramagnetic poles of a magnet and the earth
    - magnetic laws
  - ii. the theory of magnetism
    - magnetized and unmagnetized
    - magnetic field
    - magnetic lines
  - iii. magnetism properties
    - flux density (Weber's Theory)
    - forces between magnetic poles
    - induced magnetism
    - permeability
    - reluctance
    - shielding
    - permanent and temporary magnet
    - retentivity
    - residual magnetism
    - demagnetizing

2. Describe the principles of electromagnetism.
  - i. the theory of electromagnetism
    - characteristics of an electromagnetic field
    - magnetic field around a current-carrying conductor
  - ii. direction of current flow and magnetic flux
    - direction of current and flux
    - dot-cross method
    - left-hand conductor rule
    - electromagnetic coil
    - left-hand coil rule
  - iii. the electromagnet
    - characteristic of electromagnets (core, turns, strength)
    - magnetic saturation
    - core losses (hysteresis, eddy current,  $I^2R$ )
    - uses of electromagnets
3. Describe the principles and characteristics of electromagnetic induction.
  - i. principles of electromagnetic induction
    - Faraday's Law
    - factors affecting amount of induced voltage
  - ii. self and mutual induction
    - self induction
    - henries
    - CEMF
    - mutual induction
4. Describe the generation of alternating current.
  - i. direction of induced voltages
  - ii. left-hand generator rule
  - iii. alternation/revolution
  - iv. cycle
  - v. sine wave/plotting
  - vi. electrical and mechanical degrees
5. Define different values and terms of alternating current.
  - i. alternating current values
    - instantaneous values
    - maximum (peak) values

- peak to peak values
  - effective (RMS) values
  - effective (RMS) values
  - average values
- ii. terminology of alternating current circuits
- frequently/hertz
  - period
  - phase (in phase, lagging, leading)
6. Describe the characteristics of RL, RC, and RLC circuits.
- i. resistance in an AC circuit
  - ii. inductance in an AC circuit
  - iii. capacitance in an AC circuit
  - iv. impedance in an AC circuit
    - series RCL
    - trigonometric functions
    - impedance vector
  - v. AC power and power factor correction in an AC circuit
    - power factor introduction
    - pure resistive circuit
    - pure inductive circuit
    - pure capacitive
    - resistive-reactive circuit
    - apparent power and reactive power
    - power factor correction
7. Solve RL, RC, and RLC AC series circuits.
- i. AC series circuit calculations
    - circuits with resistance and inductive reactance
    - circuits with resistance capacitive reactance
    - circuits with resistance, inductive reactance and capacitive reactance
    - power factor calculation
8. Solve RL, RC and RLC AC parallel circuits.
- i. AC parallel circuit calculations
    - circuits with resistance and inductive reactance
    - circuits with resistance capacitive reactance

- circuits with resistance, inductive reactance and capacitive reactance

**Practical:**

1. Determine the properties of an AC circuit.
2. Determine absolute values in an AC series circuit containing RLC components.
3. Determine absolute values in AC parallel circuits containing RLC components.
4. Calculate power and power factor in AC circuits.

## **OL1680    Chain Saw Familiarization**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** None

### **Outcomes:**

Upon successful completion of this course, the apprentice will:

- be able to properly care for and use a chainsaw

### **Objectives and Content:**

1. Identify personal protective equipment.
  - i. hard hat, ear and eye protection
  - ii. safety pants/chaps
  - iii. safety boots
  - iv. gloves
  - v. fire extinguisher
2. Demonstrate knowledge of safety features of power chainsaws.
  - i. throttle lock-outs
  - ii. chain brakes
  - iii. safety chains
  - iv. chain catcher post
  - v. hand guards
  - vi. anti-vibration shock absorbers
  - vii. spark arrester
  - viii. on/off switch
  - ix. bar tip sprocket
  - x. blade guards
3. Demonstrate knowledge of how to prepare to work with a chainsaw.
  - i. safe starting methods
  - ii. fuel mixing and starting
  - iii. chain oil

- iv. fuel storage
- 4. Demonstrate basic knowledge of cutting with a chain saw.
  - i. the kick back zone
  - ii. chain saw pole attachment
- 5. Identify felling procedures.
  - i. pre-felling procedures
  - ii. front notch
  - iii. back cut
  - iv. holding wood
  - v. spring poles/lodged tree

**Practical:**

1. Perform basic cuts with chain saw.

## **OL1830 Customer Service Connections**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** OL1810

### **Course outcomes:**

Upon successful completion of this course, the apprentice will:

- be able to describe “customer service connections” in terms of conductors, service entrance and energy costs
- be able to install and connect a residential service

### **Theory:**

1. Explain purpose of customer services.
  - i. reliable source of energy
  - ii. standards manuals
  - iii. Canadian Electrical Code, Part 1 and 3
2. Identify conductor size and type.
  - i. neutral supported cable
  - ii. triplex
  - iii. duplex
  - iv. quadruplex
  - v. underground service conductors
3. Explain procedures for connect and disconnect.
  - i. remove load
  - ii. complete appropriate forms
  - iii. disconnect for non-payment of power bill
4. Explain service entrances.
  - i. size and type
  - ii. importance of grounding

- iii. conductor identification
- 5. Identify electric energy costs.
  - i. rates
  - ii. calculations
- 6. Explain importance of public relations.

**Practical:**

- 1. Install and connect a residential service.

## **OL1700 Interpret Drawings, Specifications and Standards**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the powerline technician occupation.

**Pre-Requisites:** None

### **Course outcomes:**

Upon successful completion of this unit of instruction, the apprentice will:

- interpret information from electrical drawings and standards

### **Theory:**

1. Identify information from blueprints and drawings.
2. Read electrical drawings.
  - i. schematic diagrams
  - ii. electrical symbols
  - iii. project plan symbols
3. Interpret specifications.
  - i. interpret specifications
  - ii. Interpret specifications (company standards books)
4. Introduce one-line diagrams.
  - i. transmission and substation diagrams
  - ii. distribution one-line diagrams
  - iii. sample diagrams

## **OL1710 Distribution Line Construction and Design I**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** OL-1700

### **Course outcomes:**

Upon successful completion of this course, the apprentice will:

- be able to apply the proper methods of installation of support apparatus and supporting structures

### **Theory:**

1. Identify support apparatus for distribution line construction.
  - i. support structure
  - ii. poles, guys and conductors
2. Explain specifications for pole classification.
  - i. classifications and dimensions
  - ii. breaking strength
  - iii. pole strength classes
3. Identify procedures for good pole storage.
  - i. steps to prevent decay.
4. Identify procedures for pole hauling.
  - i. the pole pile
  - ii. loading operation
  - iii. binding the load
  - iv. transporting
  - v. unloading
5. Explain methods for hole digging.
  - i. manual method
  - ii. hydraulic method

- iii. backhoe method
- 6. Explain procedures for pole setting.
  - i. facing poles
  - ii. erecting poles
  - iii. piking method
  - iv. gin pole method
  - v. derrick method
  - vi. backfilling and tamping
- 7. Explain methods for pole straightening.
  - i. pole straightening hazards and solutions
- 8. Identify standards for stubbing and reinforcing poles.
  - i. suitable poles
  - ii. pole inspection
  - iii. wooden reinforcing members
  - iv. galvanized steel reinforcing members
- 9. Explain guying and anchoring.
  - i. guy tension
  - ii. guy wire sizes, grade strengths, mass
  - iii. types of guys
  - iv. anchors
  - v. types of anchors
- 10. Explain “tailboard checklist” for job planning risk management.

**Practical:**

- 1. Install guys.
- 2. Identify, handle and store poles.
- 3. Excavate pole holes.
- 4. Erect poles.
- 5. Install anchors.

## **OL1711 Distribution Line Construction and Design II**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** OL-1710

### **Course outcomes:**

Upon successful completion of this course, the apprentice will be able to:

- design and construct a basic secondary distribution line

### **Theory:**

1. Identify types of secondary structures.
2. Describe the different types of secondary conductors.
3. Explain stringing, sagging, tensioning and splicing of secondary conductors.
4. Describe conductor ties.
5. Describe the different types of armor rods.

### **Practical:**

1. Design, install and maintain secondary overhead conductors.

## **OL1713 Distribution Line Design and Construction III**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** OL-1710

### **Outcomes:**

Upon successful completion of this course, the apprentice will be able to:

- design primary & secondary distribution lines

### **Objectives and Content:**

1. Identify how to select the route.
  - i. ground profile
  - ii. paralleling a highway
2. Identify methods of preserving support structures.
  - i. poles
3. Identify types and uses of guys and anchors.
  - i. guys
  - ii. single down guy
  - iii. overhead guys
  - iv. single overhead and down guy
  - v. steel guy strand
  - vi. anchors
  - vii. log anchor
  - viii. swamp anchor
  - ix. cross plate anchor
  - x. power installed screw anchor
  - xi. rock type anchor
  - xii. heel and toe anchor
  - xiii. push brace

4. Identify requirements of electrical design.

- i. insulators
- ii. pin type
- iii. suspension type
- iv. post type
- v. electrical characteristics of insulators
- vi. mechanical characteristics of insulators
- vii. suspension type
- viii. pin type
- ix. cross arms
- x. hardware

5. Identify types of structures.

- i. single pole (with conductors only)
- ii. tangent
- iii. angle
- iv. dead-end
- v. take-off (or tap)
- vi. joint use construction
- vii. self-supporting wood poles

6. Identify types of equipment and apparatus structures.

- i. transformer installation poles
- ii. installation  $\text{SØ}$  and  $3\text{\o}$  switching points
- iii. oil reclosers
- iv. voltage regulators
- v. capacitor installations
- vi. clearances
- vii. public safety
- viii. metering apparatus CT's and PT's

7. Identify electrical distribution system.

- i. distribution system
- ii. single-phase circuit
- iii. three-phase circuit
- iv. identifying the neutral

8. Identify underground distribution facilities.

- i. types of cables

- ii. duct systems
- iii. direct buried systems
- iv. connectors and splices
- v. terminations
- vi. pothead type
- vii. slip-on type
- viii. padmount transformers
- ix. pad-mounted switch gear

**Practical:**

Install and maintain single phase and three phase primary overhead conductors.

## OL1720 Conductors

### NOA Reference:

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** None

### Course outcomes:

Upon successful completion of this course, the apprentice will:

- have been provided information concerning conductors, conductor connections, conductor splicing and the tools associated with splicing and connections

### Theory:

1. Identify different types of conductors.
  - i. solid conductors
  - ii. stranded conductors
  - iii. ACSR (Aluminum Conductor Steel Reinforced )
  - iv. ASC (Aluminum Stranded Conductor)
  - v. AASC (Aluminum Alloy Stranded Conductor)
  - vi. copper
2. Explain the storing, handling and maintenance of conductors.
  - i. unloading
  - ii. damage to conductors
  - iii. wire reels
  - iv. lifting reels
  - v. care of conductors
3. Demonstrate insulator ties.
  - i. tire wire
  - ii. performed ties
  - iii. clamping
4. Explain conductor connections.

- i. factors concerning conductor connections
  - ii. contact resistance
  - iii. creep
  - iv. surface oxide
  - v. corrosion
  - vi. thermal effects
5. Explain splices.
- i. importance
  - ii. types of splices
  - iii. full tension splices
  - iv. jumper splices (non-tension)
  - v. repair splices (non-tension)
  - vi. service lead splices
  - vii. types of sleeves
  - viii. automatic tension splice
  - ix. one piece sleeve
  - x. two piece sleeve
6. Explain types of conductor vibration.
- i. aerolian
  - ii. galloping
7. Explain types of mechanical presses.
- i. OH-25 hand tool
  - ii. MD6-8 hand tool
  - iii. adjustment of MD6-8
8. Explain types of hydraulic presses.
- i. Y35 & Y35-2 hydraulic tool
  - ii. care of the Y35
  - iii. fluid loss of hydraulic press
  - iv. refilling the tool reservoir
  - v. hydraulic pump
9. Explain impact tool.
- i. tools and shells
  - ii. tool maintenance
  - iii. daily servicing

- iv. inspection of stress area
- v. weekly servicing breech cap assembly
- vi. power unit
- vii. power unit cleaning
- viii. safety instructions
- ix. the “fail safe” mechanism
- x. the safety sleeve

**Practical:**

Select, use and maintain compression tools.

Select, use and maintain explosive actuated tools.

## **OL1730 Conductor Sizes and Measurements**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** OL-1720

### **Course outcomes:**

Upon successful completion of this course, the apprentice will:

- be aware of the importance of the proper selection of the conductor (in relation to sizing) when designing and constructing distribution and transmission facilities

### **Theory:**

1. Identify factors in conductor selection.
  - i. current carrying capacity
  - ii. voltage drop
2. Explain unit of measurement.
  - i. gauge sizes
  - ii. circular mil sizes
3. Explain conductor charts.
  - i. reading charts

### **Practical:**

Calculate circular mil area.

Use wire gauges.

Select and determine conductor sizes.

## **OL1740 Sagging Conductors**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** OL-1730

### **Course outcomes:**

Upon successful completion of this course, the apprentice will:

- be aware of the importance of sagging according to industry specifications

### **Theory:**

1. Explain sagging of conductors.

- i. sagging methods
- ii. sag boards
- iii. sag tables
- iv. span
- v. design tension
- vi. dynamometer
- vii. ruling span
- viii. initial sag
- ix. final sag

2. Results of conductor damage.

- i. elastic limit
- ii. permanent deformation
- iii. temperature

### **Practical:**

1. String, sag, and tension primary conductors.

## **OL1750 Tree Pruning**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** OL-1680

### **Course outcomes:**

Upon successful completion of this course, the apprentice will:

- be aware of the importance of and perform “tree pruning procedures”

### **Theory:**

1. Explain the importance of public awareness – customer contact.
  - i. historical, sentimental, aesthetic significance
  - ii. identify hazards to tree
  - iii. identify hazards to the overhead power lines
  - iv. identify hazards to the public
2. Explain definitions.
  - i. right-of-way
  - ii. easement
  - iii. brush
  - iv. pruning
  - v. cutting
  - vi. danger tree
  - vii. drop cut
  - viii. felling
  - ix. ornamental tree
  - x. line clearance
3. Introduce basic tree shapes.
  - i. natural shapes
  - ii. upright
  - iii. spreading
  - iv. horizontal

4. Explain tree pruning techniques.
  - i. topping
  - ii. side pruning
  - iii. directional pruning
  - iv. drop-crotching
  - v. protecting the bark
  - vi. removing branches
  - vii. tree wound dressing
  - viii. corrective pruning
  - ix. disease control
  - x. shaping
5. Introduce guidelines for utility line clearing.
  - i. safe working clearance
  - ii. procedures and guidelines
6. Explain clearances.
  - i. joint use construction practice, tree clearing and trimming
7. Explain removal and disposal procedures.
  - ii. tree removal
  - iii. limb and tree disposal

**Practical:**

1. Perform tree pruning procedures.

## **OL1850 Rigging**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

### **Pre-Requisites:** None

### **Course outcomes:**

Upon successful completion of this course, the apprentice will be able to:

- maintain synthetic and wire ropes
- explain and apply the principle of mechanical advantage
- install safe rigging

### **Theory:**

1. Understand the mechanics of simple machines.
  - i. simple machines
  - ii.  $W = F \times D$  (Work = Force x Distance)
  - iii. mechanical advantage
2. Explain the mechanical principles of levers.
3. Explain the mechanical principles of blocks and tackles.
  - i. mechanical advantage of tackle blocks
  - ii. friction in tackle blocks
  - iii. load on the fall line
  - iv. size of blocks and rope
  - v. reeving
  - vi. care of blocks
  - vii. coiling tackle blocks
4. Identify importance of rope.
  - i. usage
  - ii. maintenance

5. Explain types and advantages of various synthetic ropes.

- i. types and sizes
- ii. nylon
- iii. polyester
- iv. polypropylene
- v. other fibers
- vi. construction
- vii. twisted construction
- viii. plaited construction
- ix. braided construction
- x. parallel fibre construction
- xi. conductor ropes
- xii. composite
- xiii. handling
- xiv. uncoiling, unreeling and coiling
- xv. twisting, kinking
- xvi. throwing
- xvii. hardware
- xviii. shock loading and overloading
- xix. foreign substances
- xx. bending radius
- xxi. knots and splices
- xxii. care and inspection
- xxiii. safe working strength

6. Identify wire ropes.

- i. type and size
- ii. construction
- iii. rope lay
- iv. preforming
- v. core
- vi. care and inspection
- vii. safe working strength
- viii. clamping

7. Identify the use of rigging equipment.

- i. ladders
- ii. scaffolds
- iii. chain jack, cable jack, winches, rope blocks, slings and rope

- iv.      snatch blocks, shackles and screw jacks
- v.      Identify hand signals for lifting and hoisting

**Practical:**

- 1.      Use and maintain rigging equipment.

## **OL1690 Pole Safety**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** None

### **Course outcomes:**

Upon successful completion of this course, the apprentice will be able to:

- conduct pole inspections and install grounds.

### **Theory:**

1. Explain the importance of pole inspection.
  - i. visual inspection
  - ii. physical inspection
2. Explain process for determining “bending moment” on poles.
  - i. calculations of bending moment
  - ii. straight poles
  - iii. leaning poles
3. Identify procedures for supporting “broken poles”.
  - i. why not pike poles
  - ii. temporary guying and holdfasts

### **Practical:**

1. Install system grounds.
2. Install safety grounding ‘EPZ’ for working on various structures.
3. Install vehicle grounding.

## **OL1760    Rescue at Heights**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** OL1640, OL1650

### **Course outcomes:**

Upon successful completion of this course, the apprentice will:

- be able to use the proper procedure for performing a successful rescue

### **Theory:**

1. Identify important factors of rescue at heights.
  - i. why safety and speed is essential
  - ii. factors to be considered
2. Explain procedures for pole top rescue.
  - i. basic steps for rescuing an employee from a pole
  - ii. method for lowering an injured worker
  - iii. method for lowering a conscious worker
3. Explain pole top rescue using a bucket.
4. Explain procedures for tower rescue.
  - i. different methods
  - ii. using the shepherd hook and rescue rope
  - iii. using a rope-snubbing bracket on the victim's vertical life line
  - iv. using a rescue rope attached to the back "D" ring
5. Explain approved procedures for bucket evacuation.
6. Explain approved procedures bucket rescue.
7. Summarize hazards and precautions of rescue at heights.

**Practical:**

1. Perform pole top rescue.
2. Perform tower rescue.
3. Perform bucket rescue.
4. Perform bucket evacuation.

## **OL1770    Mobile Hydraulic Training**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** None

### **Course outcomes:**

Upon successful completion of this course, the apprentice will:

- be able to operate hydraulic equipment safely and productively on a basic level

### **Theory:**

1. Explain basic factors of a hydraulic system.

- i.     force
- ii.    pressure
- iii.   flow
- iv.    friction
- v.     energy
- vi.    work
- vii.   power
- viii.   mechanical advantage

2. Describe the characteristics of fluids.

- i.     density
- ii.    shape
- iii.   compressibility
- iv.    viscosity
- v.     stability

3. Explain components of power take-off systems.

4. Explain components of hydraulic pumps.

- i.     governor
- ii.    electronic governor

- iii. hydraulic oil reservoir
  - iv. hydraulic oil
  - v. filters and strainers
  - vi. hoses, tubing and fittings
  - vii. hose
  - viii. tubing
  - ix. fittings
5. Identify types of valves.
- i. control valve
  - ii. pressure relief valve
  - iii. holding valve actuators
6. Explain basic hydraulic systems.
- i. schematic diagram
  - ii. outriggers
  - iii. lift cylinders
  - iv. extension cylinder
  - v. bucket leveling cylinder
  - vi. digger motor and auger

**Practical:**

1. Set up and operate various types of hydraulic equipment.
2. Perform daily operational checks on hydraulic aerial devices and radial boom derrick vehicles and material handlers.

## **OL1600 Traffic Control Person**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** None

### **Course outcomes:**

Upon successful completion of this course, the apprentice will:

- explain the importance of traffic control
- be able to apply the methods and techniques of stopping, slowing and directing traffic

### **Theory:**

1. Explain the importance of signalers.
  - i. responsibility
  - ii. warn the public
2. Identify where and when signalers are needed.
  - i. safe travel path
  - ii. construction equipment
3. Define signaler's uniforms and codes.
  - i. qualifications
  - ii. signaling procedures
4. Explain proper dress and equipment for signalers.
  - i. daylight
  - ii. dark
5. Identify proper position for signaler.
  - i. traffic lane
  - ii. additional signalers
6. Identify examples of types of communication between signalers.

- i. visual
  - ii. field telephone
  - iii. traffic light system
  - iv. two-way radios
7. Define standards for size and type of paddle.
- i. standard paddle
  - ii. mounted on staff
8. Demonstrate how to stop traffic.
- i. stop traffic in daytime
  - ii. stop traffic at night
9. Demonstrate how to direct traffic.
- i. slow traffic
  - ii. move traffic
10. Outline General Instructions for Signalers.
- i. advance warning signs
  - ii. do's
  - iii. don'ts

**Practical:**

1. Direct traffic.

## **OL1780      Transmission Structures**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** None

### **Course outcomes:**

Upon successful completion of this course, the apprentice will:

- identify different transmission lines by design and voltage level

### **Theory:**

1. Introduction.
  - i. definition
  - ii. characteristics
2. Necessity for higher voltage.
  - i. losses
3. Interconnection.
  - i. a difference between distribution and transmission lines
4. Rights of way.
  - i. difference between distribution and transmission lines
5. Sample structures.
  - i. 69 KV single pole
  - ii. 69 KV "H" – Frame
  - iii. 138 KV "H" – Frame
  - iv. 138 KV "H" – Frame with overhead ground wire
  - v. 138 KV Steel Tower
  - vi. 230 KV Gulfport
  - vii. 345 KV Guyed Portal

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6. Insulation.
  - i. identify design voltage level by insulation
7. Overhead ground wire.
  - i. purpose
  - ii. various sizes
8. Safe minimum approach distances (limits of approach).

## **OL1790      Grounds (Personnel, Structure and Vehicle)**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** ER-1180

### **Course outcomes:**

Upon successful completion of this course, the apprentice will:

- be able to explain the theory and install "permanent system grounds" and "temporary safety grounds"

### **Theory:**

1. Explain grounding.
  - i. ground rods
  - ii. earth as conductor
2. Explain isolated circuits.
  - i. simple isolated circuit
  - ii. safety concerns
3. Explain system grounds.
  - i. single conductor circuit
  - ii. multi-grounded systems
4. Explain safety grounds.
  - i. new circuits or apparatus can become re-energized
  - ii. theory of safety grounding
  - iii. short circuit conditions
  - iv. bonding
  - v. temporary grounding for personnel on structures
  - vi. secondary grounding
  - vii. the purpose of safety grounding
  - viii. methods of safety grounding
  - ix. grounding equipment

- x. grounding practices
5. Explain personal protective bonding.
    - i. ground switches
    - ii. phase bonding
    - iii. bonding a line with an overhead ground wire
    - iv. bonding without an overhead ground wire
    - v. step potential
    - vi. touch potential
    - vii. what bonding eliminates or drains off
  6. Explain vehicle grounding.
    - i. purpose of vehicle grounding
    - ii. grounding equipment
    - iii. grounding practices
    - iv. grounding procedures

**Practical:**

1. Install system grounds.
2. Install safety grounding “EPZ” for working on various structures.
3. Install vehicle grounding.

## **OL1840 Single-Phase Revenue Metering**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

### **Pre-Requisites:** ER-1180

### **Course outcomes:**

Upon successful completion of this course, the apprentice will:

- be able to describe the various types of single-phase watt hour meters and to explain and install, read, disconnect and reconnect meters.

### **Theory:**

1. Describe various types of single-phase A.C. watthour meters.
  - i. types of meters
  - ii. meter mounting arrangement
  - iii. type of service
  - iv. energy or energy and demand
  - v. self-contained or transformer-rated
2. Explain calibration, testing, and sealing.
  - i. rating
  - ii. meter multipliers
  - iii. identifying numbers
  - iv. records
  - v. construction
3. Explain the application of meters for single-phase, two-wire circuits and single-phase, three-wire circuits.
  - i. single-phase, two-wire circuit
  - ii. single-phase, three-wire circuit
4. Identify responsible installation and customer service procedures.
  - i. dispute tests
  - ii. installation practices

- iii. servicing meters
- iv. installation
- v. disconnect
- vi. removal
- vii. reconnect
- viii. meter changes
- ix. reading meters
- x. energy meter register
- xi. demand reading

**Practical:**

1. Install, read, disconnect and reconnect meters.

## **OL1820 Street Lighting**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** None

### **Course outcomes:**

Upon successful completion of this course, the apprentice will be able to:

- perform street lighting repair

### **Theory:**

1. Discuss the history and development of the high intensity discharge lamp.
  - i. mercury lamp
  - ii. fluorescent lamps
  - iii. metal halide
  - iv. high pressure sodium
  - v. Light Emitting Diode (LED)
2. Identify street light fixture components.
  - i. cast aluminum case
  - ii. hinged door
  - iii. adjustable slip fitter
  - iv. bird stop
3. Identify internal circuit components.
  - i. terminal block
  - ii. ballast
  - iii. threaded lamp socket
  - iv. reflector
  - v. refractor
  - vi. photoelectric control

4. Identify street light installation procedures.
  - i. clearances from energized conductors and apparatus
  - ii. grading of street lights
5. Identify dusk to dawn lighting unit installation procedures.
  - i. clearances from energized conductors and apparatus
  - ii. grading of dusk to dawn lighting units
6. Identify current street lighting fixture type.
  - i. basic lamp information
  - ii. lamp construction
  - iii. high pressure sodium
  - iv. theory of operation
  - v. ballast
  - vi. why use a ballast
  - vii. ballast functions
  - viii. retrofit kits
  - ix. the nameplate information
  - x. the transformer
  - xi. capacitor
  - xii. arrangement
  - xiii. street light test unit
  - xiv. testing photo cells
  - xv. testing bulb
  - xvi. fused power supply
  - xvii. street light control and retrofit kit
  - xviii. photo control receptacle
  - xix. photo electric control
  - xx. transformer
  - xxi. capacitor
  - xxii. igniter or starter
7. Explain types of street lighting system connections.
  - i. series circuit
  - ii. parallel circuit
8. Identify the types of street light control systems.
  - i. multiple controls

- ii. pilot wire
  - iii. cascade
  - iv. individual
  - v. photo electric control
9. Explain construction and procedures for repairing street lights and dusk to dawn lights.
- i. troubleshooting high intensity lighting systems
  - ii. corrective maintenance
10. Identify standard work methods for street light repairs.

**Practical:**

1. Install and connect streetlights.

## OL1810    Transformers

### NOA Reference:

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

### Pre-Requisites: ER-1180

### Course outcomes:

Upon successful completion of this course, the apprentice will be able to:

- identify and describe transformer types which may be encountered by the powerline technician and their basic operating principles

### Theory:

1. Explain importance of and purpose of transformers.
  - i. purposes of transformers
  - ii. transformer windings
  - iii. transformer types
2. Identify the basic components contained in the construction of distribution transformers.
  - i. core
  - ii. windings
  - iii. oil
  - iv. bushings
  - v. gaskets
  - vi. tank
  - vii. cover
  - viii. taps and tap changer
  - ix. mounting brackets
3. Identify the principles of transformation in distribution transformers.
  - i. transformer operation
  - ii. transformer losses and efficiency
  - iii. transformer ratio
  - iv. turns

- v. voltage current
  - vi. calculations
  - vii. polarity
4. Explain the importance of transformer grounding and bonding.
  5. Identify the importance of considering transformer ratings when deciding on a specific application.
    - i. voltage
    - ii. capacity
    - iii. impedance
  6. Identify the requirements that must be met before transformers can be paralleled.
    - i. voltage ratios
    - ii. impedance
    - iii. polarity
    - iv. connections
  7. Identify the purpose of transformer fusing and the factors that influence the selection of a transformer fuse size.
    - i. protection
    - ii. factors
    - iii. standard types "T" and "K"
    - iv. purposes of a transformer fuse

**Practical:**

1. Perform transformer checks.
2. Install and connect various transformers.
3. Use measuring instruments.
4. Select proper transformer fusing.
5. Install transformer grounding.

## **AP1100 Introduction to Apprenticeship**

### **Description:**

This course is designed to give participants the knowledge base and skills necessary to understand and successfully navigate the apprenticeship/red seal program.

### **Course Outcomes:**

Upon successful completion of this course, the apprentice will be able to:

- identify the requirements for registering in an Apprenticeship Program
- describe the registration process
- explain the steps to complete the Apprenticeship Program
- articulate the roles of the Apprentice, Journeyperson, Training Institutions, Industry and Governing Bodies in the Apprentice Program
- explain the significance of the Red Seal Program

**Pre-Requisites:** None

### **Objective and Content:**

1. Define Apprenticeship.
  - i. define Apprenticeship and Red Seal Certification
  - ii. discuss the definition of Apprenticeship and Red Seal Certification
  - iii. distinguish between Red Seal and Provincial Certification
2. Explore how Apprenticeship is governed and administered
  - i. explain who is responsible for administrating apprenticeship
    - Department of Education
    - Provincial Apprenticeship and Certification Board
3. Explore the roles and responsibilities of those involved in the apprenticeship process.
  - i. Apprentice
  - ii. Employer/Journeyperson
  - iii. Industrial Training Division

- explain when and where to take the in-class portion of advance training
  - discuss Class Calls
- iv. Training Institutions
- Various Delivery Methods
- v. Provincial Apprenticeship and Certification Board
4. List and explain the steps in the apprenticeship process.
- i. explain the Registration Process
  - ii. describe apprenticeship as an agreement between employee, employer and Provincial Government
  - iii. review a Memorandum of Understanding
  - iv. legal document
  - v. review an Application of Apprenticeship
    - original High School Certificate or equivalent
    - original transcript from the applicants Training Institution
  - vi. describe the roles of Institutional and Industrial Education Division of the Department of Education in Apprenticeship
  - vii. explain the role of the Program Development Officer
    - define probation period
    - discusses what constitutes a cancellation of apprenticeship
    - explain the consequences of an Apprenticeship cancellation
    - discuss the purpose of the Record of Occupational Progress (Log Book)
    - explore how to maintain your log book
      - discuss who is responsible for tracking and signing-off on trade skills
      - explain how and where to record hours worked
      - identify the importance of updating your file with your Program Development Officer
  - viii. differentiate between Provincial and Interprovincial exams
5. Describe the training and education requirements.
- i. discuss the factors affecting on-the-job and in class portions of your training
  - ii. define in school and on the job training
    - review a Plan of Training
    - identify the percentage of on-the-job and in class training time

- current labour market implications on completing an apprenticeship program
6. Explain Plans of Training.
- i. identify what is included in the Plan of Training
    - entrance requirements
    - duration of in-school and on-the-job training
    - course content
    - entry level or advanced level
  - ii. explain how a Journeyperson Certificate is achieved
    - discuss Certificate of Qualification
    - discuss Certificate of Apprenticeship
    - discuss Red Seal endorsement
7. Discuss the Red Seal Program.
- i. define designated trade
  - ii. explore the National Occupational Analysis for your trade
  - iii. explain Interprovincial Standards Red Seal Program and how it works
    - labor mobility
    - qualification recognition
  - iv. discuss the range of careers possible in your chosen trade
8. Explain apprenticeship progression schedule and wage rates.
- i. review a Record of Occupational Progress (Log Book)
  - ii. hours per program
  - iii. requirements for progression
  - iv. wage rates per year of apprenticeship
9. Identify the examinations and evaluation process used in Apprenticeship.
- i. discuss occupational tests and examinations as directed by the Provincial Apprenticeship and Certification Board
    - Theory
    - Practical
  - ii. explain formal assessment and the pass mark of 70%
10. Examine some of the financial incentives available to apprentices.
- i. employment insurance (E.I.) Benefits
  - ii. government sponsored student loans
  - iii. apprenticeship incentive Federal and Provincial

- iv. scholarships
- 11. Continuing training outside the Province of Newfoundland and Labrador.
  - i. training in other provinces and territories
    - procedure for registration and recognition of hours and skills in other provinces
  - ii. options for Dual Certification
    - transfer of credits
- 12. Review and define the following terms:
  - i. Apprenticeship Program Accreditation
  - ii. Cancellation of Apprenticeship
  - iii. Certificate of Apprenticeship
  - iv. Certificate of Qualification
  - v. Certification Renewal
  - vi. Criteria for Eligibility
  - vii. Journey person
  - viii. Practical Examination
  - ix. Prior Learning
  - x. Record of Occupational Progress (Logbook)
  - xi. Red Seal Certification
  - xii. Registered Apprentice
  - xiii. Theoretical Examination
  - xiv. National Occupational Analysis (NOA)
  - xv. Class Call
  - xvi. Dual certification

**Practical:**

1. Review the Provincial Apprenticeship web site: [www.gov.nl.ca/app](http://www.gov.nl.ca/app)
  - i. identify the requirements for registering as an apprentice and the registration process
  - ii. explain the steps to complete an apprenticeship program
  - iii. identify who is responsible for tracking and signing-off on trade skills
  - iv. identify the nearest Industrial Training Office to your community
  - v. identify the current incentives available to apprentices

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2. Review a plan of training on the Provincial Apprenticeship web site.
  - i. identify the hours for your trade (in-school and on-the-job)
  - ii. explain the roles and responsibilities of the following stakeholders in the apprenticeship process: employer, apprentice, training institution and the Industrial Training Division
3. Visit the Red Seal Web site <http://www.red-seal.ca>, review the National Occupational Analyses for your trade.
  - i. review the scope of work for your occupation and identify the industry sectors and job types requiring your trade
  - ii. identify the trends of your trade
  - iii. provide a list of Personal Protective Equipment required for your trade

## **MA1060 Basic Math**

### **Description:**

This course in Basic Math requires knowledge of general mathematical concepts and processes to enable trades persons to function in the institutional setting by developing numeracy skills required for technical courses. This math course should also provide a foundation for experiential learning through knowledge of math relating to on-the-job skills and practices. A detailed course outline is available from Institutional and Industrial Education, Standards and Curriculum Division to training institutions upon request.

### **Course Outcomes:**

- To develop numeracy skills and knowledge required for institutional and on-the-job learning.
- To develop the capability to apply mathematical concepts in the performance of trade practices.
- To develop an appreciation for mathematics as a critical element of the learning environment.
- To use mathematical principles accurately for the purposes of problem solving, job and materials estimation, measurement, calculation, system conversion, diagram interpretation and scale conversions, formulae calculations, and geometric applications.

**Pre-Requisites:** None

### **Course Objectives (Knowledge):**

1. Define and calculate using whole number operations.
2. Define and demonstrate use of correct orders of operations.
3. Demonstrate examples of operations with fractions and mixed numbers.
4. Demonstrate examples of operations with decimals.

5. Demonstrate examples of operations with percentages.
6. Employ percent/decimal/fraction conversion and comparison.
7. Define and calculate with ratios and proportions.
8. Use the Imperial Measurement system in relevant trade applications.
9. Use the Metric Measurement system in relevant trade applications.
10. Perform Imperial/Metric conversions.
11. Define and demonstrate the formulation of variables.
12. Demonstrate and define the various properties of angles and make relevant calculations.

**Major Tasks/Sub-tasks (Skills):**

**Note:** To emphasize or further develop specific knowledge objectives, students may be asked to complete practical demonstrations which confirm proper application of mathematical theory to job skills.

## **CM2150 Workplace Communications**

Evaluate presentations.

### **Description:**

This course is designed to introduce students to the principles of effective communication including letters, memos, short report writing, oral presentations and interpersonal communications.

### **Course Outcomes:**

Upon completion of the course, students will be able to:

- understand and apply communication skills as outlined in the Employability Skills 2000, Conference Board of Canada
- understand the importance of well-developed writing skills in business and in career development
- understand the purpose of the various types of business correspondence
- examine the principles of effective business writing
- examine the standard formats for letters and memos
- write effective letters and memos
- examine the fundamentals of informal reports and the report writing procedure
- produce and orally present an informal report
- examine effective listening skills and body language in communication

**Pre-Requisites:** None

### **Objectives and Content:**

1. Apply rules and principles for writing clear, concise, complete sentences which adhere to the conventions of grammar, punctuation, and mechanics.
2. Explain the rules of subject-verb agreement.
3. Define and describe the major characteristics of an effective paragraph.

4. Examine the value of business writing skills.
  - i. describe the importance of effective writing skills in business
  - ii. describe the value of well-developed writing skills to career success
5. Examine principles of effective business writing.
  - i. discuss the rationale and techniques for fostering goodwill in business communication, regardless of the circumstances
  - ii. review the importance of revising and proofreading
  - iii. differentiate between letter and memo applications in the workplace and review samples
  - iv. identify the parts of a business letter and memo
  - v. review the standard formats for business letters and memos
  - vi. examine samples of well-written and poorly written letters and memos
  - vii. examine guidelines for writing sample letters and memos which convey: acknowledgment, routine request, routine response, complaint, refusal, persuasive request and letters of appeal
6. Examine the fundamentals of informal business reports.
  - i. identify the purpose of the informal report
  - ii. identify the parts and formats of an informal report
  - iii. identify methods of information gathering
  - iv. describe the methods of referencing documents
  - v. review the importance of proof reading and editing
7. Examine types of presentations.
  - i. review and discuss components of an effective presentation
  - ii. review and discuss delivery techniques
  - iii. review and discuss preparation and use of audio/visual aids
  - iv. discuss and participate in confidence building exercises used to prepare for giving presentations
8. Interpersonal communications.
  - i. examine and apply listening techniques
  - ii. discuss the importance of body language

**Practical:**

1. Write well-developed, coherent, unified paragraphs which illustrate the following: a variety of sentence arrangements; conciseness and clarity; and adherence to correct and appropriate sentence structure, grammar, punctuation, and mechanics.
2. Write sample letters and memos which convey: acknowledgment, routine request, routine response, complaint, refusal, persuasive request and letters of appeal.
3. Gather pertinent information, organize information into an appropriate outline and write an informal report with documented resources.
  - i. edit, proofread, and revise the draft to create an effective informal report and present orally using visual aids
  - ii. participate in confidence building exercises
4. Present an effective presentation.
5. Evaluate presentations.

## **MR1220 Customer Service**

### **Description:**

This course focuses on the role of providing quality customer service. It is important to have a positive attitude and the necessary skills to effectively listen and interpret customer concerns about a product, resolve customer problems, and determine customer wants and needs. Students will be able to use the skills and knowledge gained in this course to effectively provide a consistently high level of service to the customer.

### **Course Outcomes:**

Upon successful completion of this course, students will be able to:

- define customer service
- explain why service is important
- describe the relationship between “service” and “sales”
- demonstrate an understanding of the importance of a positive attitude
- demonstrate methods of resolving customer complaints

**Pre-Requisites:** None

### **Objectives and Content:**

1. Define quality service.
  - i. identify and discuss elements of customer service
  - ii. explain the difference between service vs. sales or selling
  - iii. explain why quality service is important
  - iv. identify the various types of customers and challenges they may present
  - v. describe customer loyalty
  - vi. examine barriers to quality customer service
2. Explain how to determine customer's wants and needs.
  - i. identify customer needs

- ii. explain the difference between customer wants and needs
  - iii. identify ways to ensure repeat business
3. Demonstrate an understanding of the importance of having a positive attitude.
- i. identify and discuss the characteristics of a positive attitude
  - ii. explain why it is important to have a positive attitude
  - iii. explain how a positive attitude can improve a customer's satisfaction
  - iv. define perception and explain how perception can alter us and customers
  - v. describe methods of dealing with perception
4. Communicating effectively with customers.
- i. describe the main elements in the communication process
  - ii. identify some barriers to effective communication
  - iii. explain why body language is important
  - iv. define active listening and state why it is important
  - v. identify and discuss the steps of the listening process
  - vi. identify and discuss questioning techniques
5. Demonstrate using the telephone effectively.
- i. explain why telephone skills are important
  - ii. describe the qualities of a professional telephone interaction
6. Demonstrate an understanding of the importance of asserting oneself.
- i. define assertiveness
  - ii. discuss assertive techniques
  - iii. explain the use of assertiveness when dealing with multiple customers
7. Demonstrate techniques for interacting with challenging customers in addressing complaints and resolving conflict.
- i. examine and discuss ways to control feelings
  - ii. examine and discuss ways to interact with an upset customer
  - iii. examine and discuss ways to resolve conflict/customer criticism
  - iv. examine and discuss ways to prevent unnecessary conflict with customers

**Practical:**

1. Participate in activities to demonstrate knowledge of the course objectives.

## **SP2330      Quality Assurance/Quality Control**

### **Description:**

This course is designed to give students an understanding of the concepts and requirements of QA/QC such as, interpreting standards, controlling the acceptance of raw materials, controlling quality variables and documenting the process. It includes information on quality concepts, codes and standards, documentation, communications, human resources, company structure and policy, teamwork and responsibilities.

### **Course Outcomes:**

Upon completion of this course, students will be able to:

- Develop the skills and knowledge required to apply quality assurance/quality control procedures as related to the trade.
- Develop an awareness of quality principles and processes.
- Apply quality assurance/quality control procedures in a shop project.

**Pre-Requisites:** None

### **Objectives and Content:**

1. Describe the reasons for quality assurance and quality plans.
2. Explain the relationship between quality assurance and quality control.
3. Describe quality control procedures as applied to the production and checking of specifications and processes in applicable occupations.
4. Describe quality control procedures as applied to the acceptance and checking of raw materials.
5. Explain the role of communications in a quality environment.

6. Explain why it is important for all employees to understand the structure of the company and its production processes.
7. Explain how human resource effectiveness is maximized in a quality managed organization.
8. Explain the role of company policy in quality management.
9. Explain the purpose of codes and standards in various occupations.
10. Explain the concepts of quality.
  - i. cost of quality
  - ii. measurement of quality
  - iii. elements of quality
  - iv. elements of the quality audit
  - v. quality standards
  - vi. role expectations and responsibilities
11. Explain the structure of quality assurance and quality control.
  - i. describe organizational charts
  - ii. identify the elements of quality assurance system such as ISO, CSA, WHMIS, Sanitation Safety Code (SSC)
  - iii. explain the purpose of the quality assurance manual
  - iv. describe quality assurance procedures
12. Examine quality assurance/quality control documentation.
  - i. describe methods of recording reports in industry
  - ii. describe procedures of traceability (manual and computer-based recording)
  - iii. identify needs for quality control procedures

**Practical:**

1. Apply quality control to a project
  - i. follow QA/QC procedures for drawings, plans and specifications in applicable occupations
  - ii. calibrate measuring instruments and devices in applicable occupations.
  - iii. interpret required standards
  - iv. follow QA/QC procedures for accepting raw materials
  - v. carry out the project
  - vi. control the quality elements (variables)
  - vii. complete QA/QC reports

## **MC1050    Introduction to Computers**

### **Description:**

This course is designed to give the student an introduction to computer systems. Particular emphasis is given to word processing, spreadsheet, e-mail and the Internet and security issues.

### **Course Outcomes:**

Upon completion of this course, students will have a basic understanding of:

- computer systems and their operation
- popular software packages, their applications
- security issues of computers

**Pre-Requisites:**   None

### **Objectives and Content:**

1. Identify the major components of microcomputer system hardware and software system.
2. Describe the functions of the microprocessor.
  - i. describe and give examples of I/O DEVICES
  - ii. describe primary storage (RAM, ROM, Cache)
  - iii. define bit, byte, code and the prefixes k.m. and g.
  - iv. describe secondary storage (diskettes and hard disks, CD ROMS, Zip drives, etc.)
  - v. describe how to care for a computer and its accessories
3. Describe microcomputer software.
  - i. define software
  - ii. describe types of operational and application software
  - iii. define file and give the rules for filenames and file extensions

4. Describe windows software.
  - i. start and quit a program
  - ii. demonstrate how to use the help function
  - iii. locate a specific file using the find function
  - iv. identify system settings: wall paper, screen saver, screen
  - v. start a program by using the run command
  - vi. shutting down your computer
5. Identify file management commands.
  - i. create folders
  - ii. maximize and minimize a window
  - iii. describe windows task bar
6. Describe keyboards.
  - i. identify and locate alphabetic and numeric keys
  - ii. identify and locate function key and special keys
7. Describe word processing.
  - i. describe windows components
  - ii. menu bar
  - iii. menu indicators
  - iv. document window
  - v. the status bar
  - vi. the help feature
  - vii. insertion point movements
8. Describe the procedure used to develop a document.
  - i. enter text
  - ii. change the display
9. Describe the procedure for opening, saving and exiting documents.
  - i. saving a document
  - ii. closing a document.
  - iii. starting a new document Window
  - iv. opening a document
  - v. exiting word processor
10. Describe the procedure for editing a document.
  - i. adding new text

- ii. deleting text
  - iii. using basic format enhancement (split and join paragraphs, insert text)
11. Describe the main select features.
- i. identify a selection
  - ii. moving a selection
  - iii. copying a selection
  - iv. deleting a selection
  - v. saving a selection
12. Explain how to change layout format.
- i. changing layout format: (margins, spacing, alignment, paragraph indent, tabs, line spacing, page numbering)
13. Explain how to change text attributes.
- i. changing text attributes: (bold, underline, font, etc.)
14. Describe the auxiliary tools.
- i. using spell check and thesaurus
15. Describe print features.
- i. selecting the print feature: (i.e. number of copies and current document)
  - ii. identifying various options in print screen dialogue box
16. Examine and discuss electronic spreadsheet.
- i. spreadsheet basics
  - ii. the worksheet window
17. Describe menus.
- i. menu bar
  - ii. control menu
  - iii. shortcut menu
  - iv. save, retrieve from menus
18. Describe the components of a worksheet.
- i. entering constant values and formulas
  - ii. using the recalculation feature

19. Describe use ranges.
  - i. typing a range for a function
  - ii. pointing to a range for a function
  - iii. selecting a range for toolbar and menu commands
20. Describe how to print a worksheet.
  - i. printing to the screen
  - ii. printing to the printer
  - iii. printing a selected range
21. Describe how to edit a worksheet.
  - i. replacing cell contents
  - ii. inserting and deleting rows and columns
  - iii. changing cell formats
  - iv. changing cell alignments
  - v. changing column width
  - vi. copying and moving cells
22. State major security issues in using computers.
  - i. pass words
  - ii. accessing accounts
  - iii. viruses and how they can be avoided
  - iv. identity theft and ways to protect personal information
  - v. demonstrate how to view directory structure and folder content
  - vi. organize files and folders
  - vii. copy, delete, and move files and folders
23. Describe how to use electronic mail.
  - i. e-mail etiquette
  - ii. e-mail accounts
  - iii. e-mail messages
  - iv. e-mail message with attachments
  - v. e-mail attachments
  - vi. print e-mail messages
  - vii. deleting e-mail messages
24. Explain the internet and its uses.
  - i. the world wide web(www)

- ii. accessing web sites
- iii. internet web browsers
- iv. internet search engines
- v. searching techniques
- vi. posting documents on-line

**Practical:**

1. Create a document using word processing.
2. Complete word processing exercises to demonstrate proficiency in word processing.
3. Prepare and send e-mails with attachments.
4. Retrieve documents and e-mail attachments and print copies.
5. Develop and print a spread sheet.
6. Post a document on-line.

## **SD1700    Workplace Skills**

### **Description:**

This course involves participating in meetings, information on formal meetings, unions, workers' compensation, employment insurance regulations, workers' rights and human rights.

### **Course Outcomes:**

Upon completion of this course, students will be able to:

- Participate in meetings.
- Define and discuss basic concepts of:
  - unions
  - workers' compensation
  - employment insurance
  - workers' rights
  - human rights
  - workplace diversity
  - gender sensitivity

**Pre-Requisites:** None

### **Objectives and Content:**

1. Meetings.
  - i. identify and discuss meeting format and preparation required for a meeting
  - ii. explain the purpose of an agenda
  - iii. explain the roles and responsibilities of meeting participants
  - iv. explain the purpose of motions and amendments and withdrawals
  - v. explain the procedure to delay discussion of motions
  - vi. explain the voting process
2. Unions.
  - i. state why unions exist
  - ii. give a concise description of the history of Canadian labour

- iii. explain how unions function
  - iv. explain labour's structure
  - v. describe labour's social objectives
  - vi. describe the relationship between Canadian labour and the workers
  - vii. describe the involvement of women in unions
3. Worker's Compensation.
- i. describe the aims, objectives, benefits and regulations of the Workplace Health, Safety and Compensation Commission
  - ii. explain the internal review process
4. Employment Insurance.
- i. explain employment insurance regulations
  - ii. describe how to apply for employment insurance
  - iii. explain the appeal process
  - iv. identify the components of a letter of appeal
5. Worker's rights.
- i. define labour standards
  - ii. explain the purpose of the Labour Standards Act
  - iii. identify regulations pertaining to:
    - hours of work
    - minimum wages
    - employment of children
    - vacation pay
  - iv. explain the purpose of the Occupational Health and Safety Act as it refers to workers' rights
6. Human Rights.
- i. describe what information cannot be included on an employment application
  - ii. describe what information cannot be included in an interview
  - iii. examine the Human Rights Code and explain the role of the Human Rights Commission
  - iv. define harassment in various forms and identify strategies for prevention
7. Workplace diversity.
- i. define and explore basic concepts and terms related to workplace

inclusively including age, race, culture, religion, socio-economic, sexual orientation with an emphasis on gender issues and gender stereotyping.

8. Gender sensitivity.
  - i. explore gender and stereotyping issues in the workplace by identifying strategies for eliminating gender bias

**Practical:**

1. Prepare an agenda.
2. Participate in a meeting.
3. Analyze a documented case of a human rights complaint with special emphasis on the application, time frame, documentation needed, and legal advice available.

## **SD1710 Job Search Techniques**

### **Description:**

This course is designed to give students an introduction to the critical elements of effective job search techniques.

### **Course Outcomes:**

Upon completion of this course, students will be able to:

- demonstrate effective use of job search techniques

### **Pre-Requisites:** None

### **Objectives and Content:**

1.

1. Identify and examine employment trends and opportunities.
2. Identify sources that can lead to employment.
3. Access and review information on the Newfoundland and Labrador Apprenticeship and Certification Web site and the Apprenticeship Employment Gateway.
4. Analyze job ads and discuss the importance of fitting qualifications to job requirements.
5. Identify and discuss employability skills as outlined by the Conference Board of Canada.
6. Discuss the necessity of fully completing application forms.
7. Establish the aim/purpose of a resume.
8. Explore characteristics of effective resumes, types of resumes, and principles of resume format.

9. Explore characteristics of an effective cover letter.
10. Identify commonly asked questions in an interview.
11. Explore other employment related correspondence.
12. Explore the job market to identify employability skills expected by an employer.
13. Conduct a self-analysis and compare with general employer expectations.
14. Discuss the value of establishing and maintaining a portfolio.

**Practical:**

1. Complete sample application forms.
2. Write a resume.
3. Write an effective cover letter.
4. Establish a portfolio.
5. Write out answers to commonly asked questions asked during interviews.
6. Identify three potential employers from the Apprenticeship Employment Gateway, Apprenticeship and Certification website.

## **SD1720 Entrepreneurial Awareness**

### **Description:**

This course is designed to introduce the student to the field of entrepreneurship, including the characteristics of the entrepreneur, the pros and cons of self-employment, and some of the steps involved in starting your own business.

### **Course Outcomes:**

Upon completion of this course, the student will be able to:

- identify the various types of business ownership, the advantages and disadvantages of self-employment and identify the characteristics of an entrepreneur
- state the purpose and identify the main elements of a business plan

**Pre-Requisites:** None

### **Objectives and Content:**

1. Explore self-employment: An alternative to employment.
  - i. identify the advantages and disadvantages of self-employment vs. regular employment
  - ii. differentiate between an entrepreneur and a small business owner
  - iii. evaluate present ideas about business people
2. Identify and discuss various types of business ownership.
  - i. explore the characteristics of entrepreneurs
  - ii. identify characteristics common to entrepreneurs
  - iii. compare one's own personal characteristics with those of entrepreneurs
  - iv. examine one's present ideas about business people
3. Identify business opportunities.
  - i. distinguish between an opportunity and an idea
  - ii. examine existing traditional and innovative business ventures

- iii. identify and summarize the role of various agencies that support business development
4. Review the entrepreneurial process.
- i. explain the entrepreneurial process
  - ii. describe the purpose of a business plan

## **Block 2**

### **OL2510      System Operating Practices**

#### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Prerequisites:** Completion of first year course

#### **Course outcomes:**

Upon successful completion of this course, the apprentice will be able to:

- perform working on the transmission and distribution systems

#### **Theory:**

1. Identify procedures for the operation of switches and protective devices.
  - i. opening and closing switches and protective devices
  - ii. transmission system operations
  - iii. distribution system operations
2. Explain the standard protection code.
  - i. hold-off
  - ii. purpose
  - iii. identification
  - iv. work permit
  - v. purpose
  - vi. identification

#### **Practical:**

1. Perform exercises as directed by the instructor.

## OL2520 Three-Phase Theory

### Outcomes:

Upon the successful completion of this unit the apprentice will be able to:

- perform three-phase voltage, current and power calculations

**Pre-Requisites:** ER1180

### Objectives and Content:

1. Describe the generation of three-phase voltages.
  - i. characteristics of three-phase
  - ii. voltage generation of three-phase voltages
  - iii. phase sequence
2. Describe the voltage and current values in three-phase wye connections.
  - i. voltage relationships in a wye connection
  - ii. current relationships in a wye connection
  - iii. ground connections
  - iv. 3-wire wye connections
  - v. 4-wire wye connections
  - vi. phase loss calculations
3. Describe the voltage and current values in three-phase delta connections.
  - i. cautions regarding improper delta connections
  - ii. voltage relationship in a delta connection
  - iii. current relationship in a delta connection
  - iv. open delta connections
  - v. 3-wire delta connections
  - vi. 4-wire delta connections
  - vii. comparing wye and delta systems
4. Describe the procedures used to calculate three-phase power, volt-ampress reactive power and power factor.
  - i. three-phase apparent power
  - ii. three-phase power
  - iii. power factor
  - iv. measurements for three-phase power

5. Describe the procedures used to measure three-phase power using wattmeters.
  - i. two watt meter method
  - ii. three watt meter method
  - iii. polyphase watt meter

## **OL2530 Transformer Banking**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Prerequisites:** ER1190

### **Course outcomes:**

Upon successful completion of this course, the apprentice will:

- describe the various connections available for the application of single-phase distribution transformers to three-phase systems and the implications of each connection.
- connect and test various transformer connections
- install and connect various transformer banks
- use various measuring instruments
- select proper transformer fusing

### **Theory:**

1. Requirements for banking single-phase transformers.
2. Identify types of transformer connections.
  - i. the delta-delta connection
  - ii. the wye-wye connection
  - iii. the delta-wye connection
  - iv. the wye-delta connection
  - v. the open-delta open-delta connection
  - vi. the open-wye open-delta connection
3. Identify various operating hazards.
  - i. single phase circuits
  - ii. operating single phase transformers in parallel
  - iii. three-phase circuits
  - iv. transformer bank with a delta primary
  - v. transformer bank with an open-delta primary
  - vi. transformers paralleled for single-phase service

- vii. single-phase transformers on a delta system
  - viii. transformers connected wye-delta, isolated neutral
  - ix. transformers connected open wye – open delta
  - x. transformers connected wye-wye
  - xi. single-phase transformers on a wye primary
4. Transformer fusing.
    - i. selecting the proper fuse rating
    - ii. fusing three phase banks
    - iii. open banks – transformer capacity
    - iv. fusing transformers in open banks
  5. Identify potential hazards of alternate sources of energy.
    - i. accidental energization (back feed)
    - ii. electromagnetic coupling
    - iii. electrostatic charge
  6. Wye-delta phase shift.

### **Practical**

1. Connect and test various transformer connections.
2. Install and connect various transformer banks.
3. Use various measuring instrument.
4. Select proper transformer fusing.

## OL2540 Power Transformers

### NOA Reference:

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** OL2530

### Course outcomes:

Upon successful completion of this course, the apprentice will:

- identify and describe stationary power transformers and mobile substations; their capabilities and limitations

### Theory:

1. Discuss the construction, operation, inspection and energizing procedure for stationary transformers.
  - i. definition
  - ii. construction and operation
    - windings
    - insulation
    - cooling
    - auxiliary devices
      - protective devices
      - voltage control apparatus
        - off-circuit tap changer
        - load-tap changer
    - external cooling equipment
    - effects of impedance
    - effects of load
    - exciting current
    - in-rush current
  - i. connection
  - ii. inspection
  - iii. energizing procedure

2. Identify various classes and purpose of mobile transformers and substations.

- i. classes
- ii. purposes
- iii. mobile substation
- iv. physical description
- v. nameplate data
- vi. component parts
- vii. transformer protection
- viii. set-up and operation

## **OL2550 Paralleling Three-Phase Circuits**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** OL2530

### **Course outcomes:**

Upon successful completion of this course, the apprentice will be able to:

- describe phases of a three-phase system
- perform rotation checks
- perform tests required for three phase

### **Theory:**

1. Describe phase rotation.
  - i. phase sequence
  - ii. testing rotation
2. Describe phase shift.
  - i. in transformers
  - ii. in lines
3. Explain phasing.
  - i. phasing tester
4. Explain paralleling of three-phase circuits.
  - i. transmission system
  - ii. distribution system
5. Explain the procedure for performing rotation checks & phasing tests required for three phase circuit.

### **Practical:**

## Plan of Training – Powerline Technician (Operating)

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1. Perform phase rotation checks.
2. Perform phasing tests required for paralleling three phase circuits.

## **OL2560 Single-Phase and Three-Phase Revenue Metering**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** OL-2520

### **Course outcomes:**

Upon successful completion of this course, the apprentice will be able to:

- explain how instrument transformers are used in both single and three-phase metering installations
- to explain the procedures for application and operation of these installations

### **Theory:**

1. Explain the two main types and uses of instrument transformers.
  - i. voltage transformers
  - ii. current transformers
  - iii. metering outfit
  - iv. multipliers
  - v. polarity marks
  - vi. records
2. Explain the application of meters and instrument transformers.
  - i. electro-mechanical meters
  - ii. digital meters
  - iii. single-phase, three-wire circuit
  - iv. three-phase, four-wire circuit
  - v. with a self-contained meter
  - vi. with a transformer-rated meter
3. Explain installation and servicing procedures.
  - i. meter test switch
  - ii. wire color codes
  - iii. test methods

- iv. mounting of instrument transformers
- v. clearance
- vi. connections

**Practical:**

1. Perform a meter test switch.

## **OL2570 Substations, Switching Stations and Terminals**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** Completion of 1<sup>st</sup> Year Course

### **Course outcomes:**

Upon successful completion of this course, the apprentice will:

- describe substations, switching stations and terminals in terms of the Powerline technician's involvement with both their operation and their inspection

### **Theory:**

1. Explain the operation and inspection of substations as they pertain to the powerline technician.
  - i. types of substations
  - ii. functions of substations
    - switching
    - transformation
    - control of system voltage
  - iii. location of substations
  - iv. line diagram
    - symbols
  - v. substation inspections
  - vi. substation trouble shooting

## **Block 3**

### **OL2610      Switches and Protective Devices**

#### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** Completion of Block 2

#### **Course outcomes:**

Upon successful completion of this course, the apprentice will:

- be able to describe the basic types of switches and protective devices and demonstrate their application to the electrical system

#### **Theory:**

##### 1. Describe the basic classes of switches and protective devices.

- i. air break devices
- ii. air circuit breaker
- iii. air break disconnect switches
- iv. non-load-break devices
- v. load break devices
- vi. loadbuster tool
- vii. fuses
- viii. oil devices
- ix. oil circuit breaker
- x. oil circuit recloser
- xi. oil switch
- xii. vacuum devices
- xiii. vacuum interrupters
- xiv. vacuum recloser
- xv. de-ionizing gas devices
- xvi. gas circuit breaker
- xvii. circuit switcher
- xviii. lightning arresters
- xix. expulsion type

xx. valve type

2. Explain over current protective device co-ordination.
  - i. protective scheme
  - ii. time current characteristics
  - iii. temporary faults
  - iv. permanent faults

**Practical:**

1. Operate various switches and protective devices.
2. Perform operations to remove switches and protective devices from service.

## OL2620    Voltage Regulation

### NOA Reference:

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** Completion of Block 2

### Outcomes:

Upon successful completion of this course, the apprentice will:

- describe the purpose, basic construction, operating principles and use of “voltage regulators” and “auto boosters”

### Objective and Content:

1. Identify devices, including their merits that can be used to modify distribution circuit voltage levels.
  - i. voltage booster transformer
  - ii. shunt capacitors
  - iii. series capacitors
  - iv. transformer load tap changer
  - v. induction voltage regulator
  - vi. step voltage regulator
  - vii. auto booster
2. Identify importance of and procedures for operating voltage regulators.
  - i. purpose of voltage regulators
  - ii. theory of voltage regulator operation
  - iii. physical features of a typical regulator
  - iv. the control panel and function of control
  - v. trouble shooting checks
  - vi. the automatic sequenced bypass switch
  - vii. putting the voltage regulator in the neutral position
  - viii. placing the voltage regulator “in” service
  - ix. removing the voltage regulator “from” service

3. Identify the major differences between an auto-booster and a voltage regulator.
4. Identify importance of proper application of voltage regulators.
  - i. regulating devices in series
  - ii. reversing the source of a regulating device

**Practical**

1. Place a regulator 'in' service.
2. Remove a regulator 'from' service.
3. Operate a regulator control panel.

## OL2631 Underground Construction

### NOA Reference:

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** Completion of Block 2

### Course outcomes:

Upon successful completion of this course, the apprentice will:

- be able to describe underground facilities including methods of installation and policies and practices governing its use.

### Theory:

1. Identify uses and consideration for underground and network systems.

- uses
  - urban system
  - underground residential distribution
  - underground dips
- considerations
  - co-ordination
  - planning
  - financial
  - design and layout
  - surveying and staking of route
  - right-of-way and easements
  - installation
  - confined space entry regulations

2. Identify major components of underground & marine cable systems.

- cables
  - physical and mechanical properties of cables
  - dimension and weight
  - flexibility
  - pulling stress

- ii. cable protection
  - mechanical protection
  - protection from corrosion
  - fusing
- iii. handling cable
  - storage during cold weather
  - installation practices
- iv. duct systems
  - types of ducts
  - design considerations
  - duct installation
  - manholes
  - cable installation
- v. direct-buried systems
- vi. system grounds
- vii. transformer installations
  - padmount
  - transclosures
  - vault
  - submersible
- viii. switches and switchgear
  - in transformers
  - in vaults
  - in special locations
- ix. cable connections
  - splices
  - connections
  - terminations
  - pothead
  - modular slip-on type
  - cold-shrink terminator
  - heat-shrink terminator
  - taped termination
  - load-break elbow
- x. taps
  - primary taps
  - secondary taps

3. Identify underground policy responsibilities.

4. Explain underground system identification procedures.
  - i. line diagrams
  - ii. geographic maps

**Practical**

1. Construct various UG cable connections, splices and terminations.

## **OL2641    Underground System Operation**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** OL2631

### **Course outcomes:**

Upon successful completion of this course, the apprentice will:

- be able to describe the methods and apparatus associated with operating an underground system.

### **Theory:**

1. Identify important characteristics of underground & marine primary cable construction.
  - i. cable insulations
  - ii. cable construction
  - iii. cable termination
    - stress cone
    - modular slip-on terminator
    - modular slip-on terminator application
    - terminator mounting bracket
  - iv. cable grounding
  - v. commissioning cables
2. Identify operating practices for switching underground systems.
  - i. live-front pad-mounting apparatus
  - ii. pad-mounted switchgear
    - operation of pad-mounted gear
    - replacing of fuses
  - iii. pad-mounted transformers
    - switches
    - transcloseres
  - iv. apparatus installed in a vault
  - v. dead-front pad-mounted apparatus

- operating and replacing the bayonet fuse
  - vi. overhead devices for underground circuits
  - vii. precautions and safety rules
3. Locating cables.
    - i. method
  4. Locating cable faults.
    - i. method
- Practical:**
1. Perform operating procedures for switching in a UG system.
  2. Use cable locating equipment.
  3. Use cable fault locating equipment.
  4. Operate and replace a bayonet fuse.

## **OL2650 Line Capacitors**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

### **Pre-Requisites:** ER1180

### **Course outcomes:**

Upon successful completion of this course, the apprentice will:

- describe the various arrangements of capacitor banks, their basic operating principles and switching and protection requirements

### **Theory:**

1. Explain capacitor construction, ratings and standards.
  - i. capacitor construction
  - ii. ratings and standards
2. Discuss capacitors installed on distribution circuits.
  - i. shunt connection
  - ii. effects
  - iii. protection
  - iv. bank fusing
  - v. individual fusing
  - vi. automatic control
  - vii. operating
  - viii. series connection
  - ix. effects
  - x. protection
  - xi. operating

3. Discuss capacitors installed on transmission circuits.
  - i. connections
  - ii. switching and protection requirements
  - iii. operating
  - iv. procedures for grounding
  - v. placing back in service

**Practical:**

1. Install capacitors.

## **OL2660    Electronic Reclosers**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** Completion of Block 2

### **Course outcomes:**

Upon successful completion of this course, the apprentice will:

- be familiar with the “electronic oil filled recloser” (EOR)

### **Theory:**

1. Provide a complete overview of the “Electronic Recloser”.
  - i. use of oil reclosers of all types and section analizers
  - ii. purpose and theory of EOR operation
  - iii. application of reclosers
  - iv. physical features of electronic reclosers
  - v. the control panel and function of controls
  - vi. operating procedures
  - vii. placing an EOR “in” service
  - viii. removing an EOR “from” service
  - ix. placing and EOR in “non-reclose” for a “hold-off”
  - x. picking up “cold load” with an EOR
  - xi. closing the EOR manually with the manual closing tool
  - xii. troubleshooting checks

### **Practical**

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

3. Close an EOR manually with the manual closing tool.
4. Place an EOR in “non-reclose” for a “hold-off”.

## **Block 4**

### **OL2710    Live Line Work (Hot Stick)**

#### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** Completion of Block 3

#### **Course outcomes:**

Upon successful completion of this course, the apprentice will be able to:

- perform basic live line hot stick (Fibreglass Reinforced Plastic - FRP) work

#### **Theory:**

1. Identify the tools and equipment necessary for live line hot stick (FRP) work.
  - i. standard kit
  - ii. tool ratings
  - iii. care and use
  - iv. testing
2. Identify safety concerns and methods employed in hot stick (FRP) work.
  - i. safety rules
  - ii. do's and don'ts
  - iii. tailboard conference
  - iv. hold-off
  - v. protection from second point of contact
  - vi. conductor reference chart
  - vii. conductor weight calculation
  - viii. conductor tension calculation
  - ix. forces acting on a deadend pole
  - x. determining the angle of a corner
  - xi. bisect tension
  - xii. application of calculation of forces to rigging
  - xiii. wire tong application

3. Identify the uses of polyethylene (rigid) cover-up equipment.
  - i. conductor and insulator covers
  - ii. hardware and crossarm covers
  - iii. pole bracket and insulator base cover
  - iv. stand off cover
  - v. metal arm cover
  - vi. conductor and insulator covers (rated 46 kv phase to phase)
4. Identify the uses of pole covers.
  - i. raising or lowering a pole between energized lines
5. Identify procedures to consider for bare hand live line work (HV).
  - i. bond-on
  - ii. conductive shield
6. Explain background theory to consider when conducting live line work High Voltage (HV).
  - i. electrostatic induction
  - ii. electromagnetic induction
  - iii. insulation from ground
  - iv. leakage current
  - v. grounding
  - vi. shielding and bonding
7. Identify safety procedures to follow when conducting bare hand live line work (HV).
  - i. job method
  - ii. tailboard conference
  - iii. personal readiness and teamwork
  - iv. working clearances
  - v. do's and don'ts
8. Identify the tools and equipment required to perform bare hand work.
  - i. conductive clothing
  - ii. ladders
  - iii. aerial devices
  - iv. non-conductive rope

**Practical:**

1. Perform a Tailboard Conference.
2. Perform vehicle and equipment checks.
3. Perform insulator changes on various structure types using proper hot stick live line procedures.
4. Perform crossarm changes on various structure types using proper hot stick live line procedures.
5. Set- up and use rigging and hoisting equipment specific to hot stick live line procedures.

## **OL2720    Live Line Work (Rubber Glove)**

### **NOA Reference:**

The material covered satisfies in whole or in part, the requirements of the National Occupational Analysis for the Powerline Technician Occupation.

**Pre-Requisites:** Completion of Block 3

### **Course outcomes:**

Upon successful completion of this course, the apprentice will be able to:

- perform basic live line rubber glove work

### **Theory:**

1. Identify the tools and equipment necessary for live line rubber glove work.
  - i. history of rubber gloving
  - ii. basic rubber glove kit
  - iii. rubber protective equipment – classification, types and ratings
  - iv. equipment testing
  - v. shop testing
  - vi. field checks
  - vii. equipment use, care and storage
2. Identify safety concerns and methods employed in rubber glove work.
  - i. safety in rubber glove work
  - ii. safety rules
  - iii. do's and don'ts
  - iv. tailboard conference
  - v. hold-off
  - vi. protection from the second point of contact
  - vii. rubber glove work methods
3. Identify the types of protective equipment.
  - i. rubber blankets
  - ii. inspection
  - iii. care and storage

- iv. line hose
  - v. low voltage
  - vi. high voltage
  - vii. care and storage
  - viii. field checking line hose
4. Explain corona effects on rubber.
    - i. definitions
    - ii. corona
    - iii. corona cutting
    - iv. corona resistant materials
  5. Identify the uses of polyethylene (rigid) or rubber cover-up equipment.
    - i. conductor and insulator covers
    - ii. hardware and crossarm covers
    - iii. pole bracket and insulator base cover
    - iv. stand off cover
    - v. metal arm cover
    - vi. conductor and insulator covers
  6. Identify the uses of pole covers.
    - i. raising or lowering a pole between energized lines

**Practical:**

1. Conduct a Tailboard Conference.
2. Perform vehicle and equipment checks.
3. Perform insulator changes on various structure types using proper hot stick live line procedures.
4. Perform cross arm changes on various structure types using proper hot stick live line procedures.
5. Set- up and use rigging and hoisting equipment specific to hot stick live line procedures.

## **APPENDIX**

## Profile Chart

Occupational Skills			
OL1620 Environment Awareness	OL1630 Orientation to the Trade	OL1641 Vehicle Familiarization	OL1650 Powerline Technician Equipment
OL1660 Basic Hand and Specialty Tools	OL1670 Basic Power Tools	OL1680 Chainsaw Familiarization	OL1700 Interprets Drawings, Specifications and Standards
OL1750 Tree Pruning	OL2710 Live Line Work (Hot Stick)	OL2720 Live Line Work (Rubber Glove)	TS1300 Rigging
Structures			
OL1690 Pole Safety	OL1710 Distribution Line Design and Construction 2	OL1711 Distribution Line Design and Construction 1	OL1713 Distribution Line Design and Construction 3
Conductor Systems			
OL1720 Conductors	OL1730 Conductor Sizes and Measurements	OL1740 Sagging Conductors	OL2631 Underground Construction
Auxiliary Equipment			
OL1620 Voltage Regulations	OL1790 Grounds	OL1820 Street Lighting	OL1830 Customer Service Connections
OL1840 Single Phase Revenue Metering	OL2530 Transformer Banking	OL2560 Single and Three Phase Revenue Metering	OL2650 Line Capacitors

## Plan of Training – Powerline Technician (Operating)

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<b>Operation, Maintenance and Repair</b>			
OL1680 Chainsaw Familiarization	OL1750 Tree Pruning	OL1780 Transmission Structures	OL1820 Street Lighting
OL2510 System Operating Practices	OL2641 Underground System Operation		

## NOA Comparison Table

NOA Sub-task		Plan of Training Unit	
Task 1 – Uses and maintains tools and equipment			
1.01	Maintains hand tools	OL1660	Basic Hand and Specialty Tools
1.02	Maintains power tools	OL1670	Basic Power Tools
1.03	Maintains powder-actuate tools	OL1670	Basic Power Tools
1.04	Maintains electrical measuring and testing equipment	OL1650	Powerline Technician Equipment
1.05	Uses climbing gear		
1.06	Uses on and off road equipment		
1.07	Uses access equipment	TS1300	Rigging
1.08	Uses rigging, hoisting and lifting equipment		
1.09	Uses PPE and safety equipment		
Task 2 – Communicates in the workplace			
2.01	Communicates verbally	OL1630	Orientation to the Trade
2.02	Communicates using hand signals		
2.03	Communicates electronically		
Task 3 – Organizes work			
3.01	Interprets codes, regulations and procedures	OL1630	Orientation to the Trade
3.02	Interprets plans, drawings, and specifications	OL1641	Vehicle Familiarization
3.03	Uses documentation and reference material	OL1700	Interpret Drawings, Specifications, and Standards
3.04	Prepares worksite		
3.05	Plans job tasks and procedures		

## Plan of Training – Powerline Technician (Operating)

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<b>Task 4 – Establishes safe work environment</b>			
4.01	Identifies powerline hazards	OL1680	Environmental Awareness
4.02	Controls powerline hazards		Chainsaw Familiarization
4.03	Controls environmental hazards		Tree Pruning
<b>Task 5 – Uses live-line methods</b>			
5.01	Uses cover up	OL2720	Live Line Work (Hot Stick)
5.02	Uses rubber gloves		Live Line Work (Rubber Glove)
5.03	Uses bare hand methods		
5.04	Uses fiberglass reinforced plastic (FRP) tools (sticks)		
<b>Task 6 – Install Poles</b>			
6.01	Selects poles	OL1710	Distribution Line Design and Construction 1
6.02	Frames poles		Distribution Line Design and Construction 2
	Sets poles		
	Installs pole guys and anchors		Distribution Line Design and Construction 3
		OL1711	Pole Safety
<b>Task 7 – Installs steel structures</b>			
7.01	Installs footings (not common core)	OL1711	Distribution Line Design and Construction 1
7.02	Assembles steel structures		Distribution Line Design and Construction 2
7.03	Erects steel structures		
7.04	Installs steel structure guy wires and anchors		Distribution Line Design and Construction 3
<b>Task 8 – installs overhead conductors</b>			
8.01	Strings overhead conductors	OL1730	Conductors
8.02	Sags overhead conductors		Conductor Sizes and Measurements
8.03	Ties-in overhead conductors		
8.04	Splices overhead conductors		Sagging Conductors
<b>Task 9 – Installs underground and marine cable</b>			

## Plan of Training – Powerline Technician (Operating)

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9.01	Installs conduit systems (not common core)	OL2631	Underground Construction
9.02	Places underground and marine cable		
9.03	Splices underground and marine cable		
9.04	Terminates underground and marine cable	OL2631	Underground Construction
<b>Task 10 – Installs lighting systems</b>			
10.01	Installs street lights	OL1820	Street lighting
10.02	Maintains street lights		
<b>Task 11 –Installs voltage control equipment</b>			
11.01	Installs transformers	OL1620 OL2650	Voltage Regulations
11.02	Installs capacitors		
11.03	Installs voltage regulators		Line Capacitors
11.04	Installs switches		
11.05	Installs reactors (not common core)		
<b>Task 12 – Install protection equipment</b>			
12.01	Installs reclosers	OL1790 OL2610	Grounds
12.02	Installs sectionalizers		
12.03	Installs fuses		Switches and Protective Devices
12.04	Installs lightning arrestors		
<b>Task 13 – Installs metering equipment</b>			
13.01	Installs primary metering	OL1830 OL1840 OL2560 OL2530	Customer Service Connections
13.02	Installs secondary metering		Single Phase Revenue Metering
			Single Phase and Three Phase Revenue Metering
			Transformer Banking

## Plan of Training – Powerline Technician (Operating)

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Task 14 – Operates distribution and transmission systems			
14.01	Operates overhead and underground transmission systems	OL2510 OL2641	System Operating Practices Underground System Operation
14.02	Operates overhead and underground distribution systems		
Task 15 – Maintains distribution and transmission systems			
15.01	Inspects distribution and transmission systems	OL1780 OL1820 OL2510 OL2641	Transmission Structures Street Lighting System Operating Practices Underground System Operation
15.02	Maintains poles		
15.03	Maintains steel structures		
15.04	Maintains system components		
15.05	Trims trees	OL1680 OL1750	Chainsaw Familiarization Tree Pruning
Task 16 – Repairs distribution systems			
16.01	Troubleshoots overhead distribution systems	OL2510 OL2641	System Operating Practices Underground System Operation
16.02	Troubleshoots underground distribution systems		
16.03	Repairs overhead distribution systems		
16.04	Repairs underground distribution systems		
Task 17 – Repairs transmission systems			
17.01	Troubleshoots overhead transmission systems	OL1780 OL2510 OL2641	Transmission Structures System Operating Practices Underground System Operation
17.02	Troubleshoots underground transmission systems		
17.03	Repairs overhead transmission systems		
17.04	Repairs underground transmission systems		