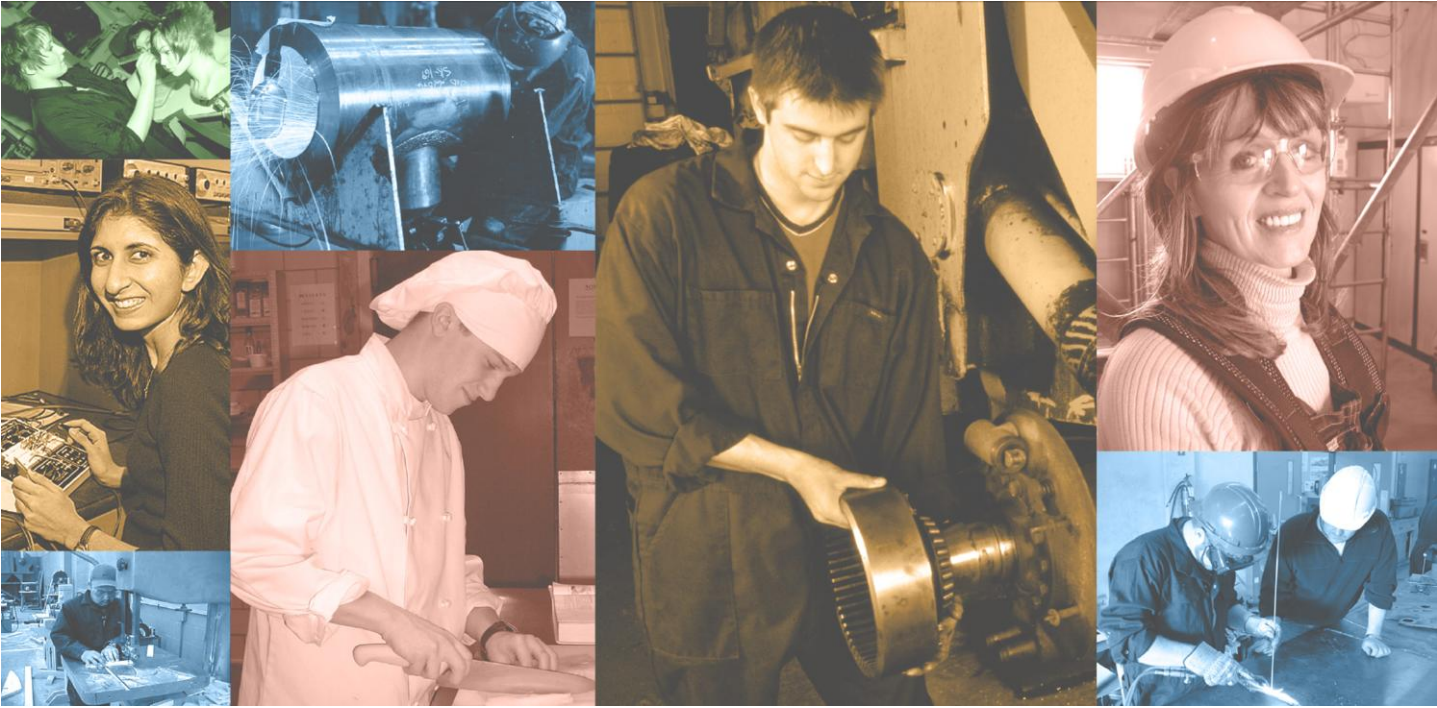

Plan of Training



**Government of Newfoundland and Labrador
Department of Advanced Education and Skills
Apprenticeship and Trades Certification Division**

PLAN OF TRAINING

Residential Electrician

December 2011



Government of Newfoundland and Labrador
Department of Advanced Education and Skills
Apprenticeship and Trades Certification Division

Approved by:

A handwritten signature in black ink, appearing to read "Paul Good", written over a horizontal line.

Chairperson, Provincial Apprenticeship and Certification Board

Date: December 13/11

The Joint Planning Committee (JPC) recognizes this Interprovincial Program Guide as the national curriculum for the occupation of Residential Electrician.

Preface

This Apprenticeship Standard is based on the 2010 edition of the National Occupational Analysis for Residential Electrician trade.

This document describes the curriculum content for the Residential Electrician 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. Program Structure

For each and every course, a formal assessment is required for which 70% is the pass mark. A mark of 70% must be attained in both the theory examination and the practical project assignment, where applicable.

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-requisite(s)
TS1520	WHMIS	6	-
TS1530	Standard First Aid	14	-
ER1100	Rigging	30	ER1410
ER1110	Hand Tools	15	ER1410
ER1121	Power Tools	24	ER1410
ER1131	Fasteners	15	ER1121
ER1140	DC Theory	30	ER1410
ER1151	Series and Parallel DC Circuits	45	ER1140
ER1160	Codes	30	-
ER1170	Voltage Drop and Power Loss	30	ER1151, ER1160
ER1180	Single Phase Theory	60	ER1170
ER1201	Drawings, Schematics and Specifications	30	ER1160
ER1220	Conduit, Tubing and Fittings	30	ER1131

Entry Level Courses – Block 1			
Course No.	Course Name	Hours	Pre-requisite(s)
ER1230	Conductors and Cables	45	ER1220
ER1241	Fundamental Wiring	60	ER1230
ER1250	Protective Devices	30	ER1230
ER1540	Single-Phase Transformers	30	ER1180,1250
ER1270	Single Phase Service Entrance	30	ER1261
ER1550	Demand Factor and Device Layout	30	ER1270, ER1160
ER1370	Distribution Equipment	20	ER1270
ER1360	Electric Heating Systems and Controls	30	ER1370
ER1410	Safety Practices	30	-
ER2421	Heat Pumps and HVAC Electrical Systems	20	ER1360
CM2150	Workplace Communications	45	-
MR1220	Customer Service	30	-
SP2330	Quality Assurance / Quality Control	30	-
MC1050	Introduction to Computers	30	-
SD1700	Workplace Skills	30	-
SD1710	Job Search Techniques	15	-
SD1720	Entrepreneurial Awareness	15	-
OT1230	Workplace Exposure	60	-
MA1060	Basic Math	60	-
AP1100	Introduction to Apprenticeship	15	-

Total Course Credit Hours	1014
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Required Work Experience

***A student who can meet the Mathematics requirement through an ACUPLACER® test may be exempted from Mathematics 1060. Please check with your training institution.**

ENTRY LEVEL – BLOCK 1

TS1520 Workplace Hazardous Materials Information Systems (WHMIS)

Learning Outcomes:

- Demonstrate knowledge of interpreting and applying the Workplace Hazardous Materials Information System (WHMIS) Regulation under the Occupational Health and Safety Act.

Duration: 6 Hours

Pre-Requisite(s): None

Objectives and Content:

1. Define WHMIS safety.
 - i. rationale and key elements
 - ii. history and development of WHMIS
 - iii. WHMIS legislation
 - iv. WHMIS implementation program
 - 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 subdivision in WHMIS
 - general rules for classification
 - class A - compressed 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 a WHMIS label
 - supplier label
 - workplace label
 - other means of identification
 - ii. responsibility 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).
- 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 Requirements:

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.

TS1530 Standard First Aid

Learning Outcomes:

- Demonstrate knowledge of recognizing situations requiring emergency action
- Demonstrate knowledge of making appropriate decisions concerning first aid

Duration: 14 Hours

Pre-Requisite(s): None

Practical Requirements:

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

ER1100 Rigging

Learning Outcomes:

- Demonstrate knowledge of lifting and rigging procedures
- Demonstrate knowledge of using rigging equipment

Duration: 30 Hours

Pre-Requisite(s): ER1410

Objectives and Content:

1. Define the terms related to mechanical advantage.
2. Identify and describe wire rope.
 - i. fatigue and abrasion resistance
 - ii. safety factor
3. Identify and describe fibre rope.
 - i. types and characteristics
 - ii. safety factor
 - iii. safe working loads
 - iv. care
 - coiling and uncoiling
 - storage
 - v. inspection
 - vi. knots, bends and hitches
4. Identify and describe chains used in rigging.
5. Identify and describe rigging hardware items and the procedures for installing them.
 - i. drums
 - ii. sheaves
 - iii. hooks

- iv. rings, links and swivels
 - v. shackles
 - vi. eye bolts
 - vii. turnbuckles
 - viii. spreader and equalizer beams
 - ix. blocks
6. Describe the procedures used to select slings.
- i. sling configurations
 - ii. sling angles
 - iii. safe working loads
7. Identify and describe jacks and their uses.
- i. screw jacks
 - ii. ratchet jacks
 - iii. hydraulic jacks
 - with integral pump
 - with separate pump (ram)
8. Describe the procedures used to select and use ladders and scaffolds.
- i. ladder safety
 - ii. tubular steel sectional scaffolding
 - iii. characteristics of steel scaffolding
 - ease of erection
 - common hoists
9. Describe procedures used to move a load.
- i. load weights
 - ii. center of gravity
 - iii. crane signals
 - iv. OSHA requirements

Practical Requirements:

- 1. Tie knots, bends, and hitches used for lifting and moving equipment.
- 2. Inspect, select and use the appropriate sling to perform a given task.
- 3. Inspect, select and use various chain blocks and rope falls.
- 4. Select and use ladders and scaffolds.

5. Secure, lift and move loads vertically and horizontally.

ER1110 Hand Tools

Learning Outcomes:

- Demonstrate knowledge of identifying, selecting, operating and caring for basic hand tools

Duration: 15 Hours

Pre-Requisite(s): ER1410

Objectives and Content:

1. Identify types of hand tools and describe their applications and procedures for care and use.
 - i. screwdrivers
 - ii. hammers
 - iii. pliers
 - iv. wrenches
 - v. saws and blades
 - vi. files
 - vii. taps and dies
 - viii. layout tools
 - ix. punches and chisels
 - x. knives
 - xi. fuse pullers
 - xii. knockout punches
 - xiii. hand benders
 - xiv. measuring instruments

Practical Requirements:

1. Identify, use and maintain screwdrivers.
2. Identify, use and maintain hammers.
3. Identify, use and maintain pliers.
4. Identify, use and maintain wrenches.
5. Select, use and maintain files.

6. Select and use hacksaw to cut various types of metal.
7. Select, use and clean taps and dies.
8. Select and use measuring and layout tools.
9. Select and use punches and chisels.
10. Select and use handsaws.
11. Select and use hand-operated knock-out punches.

ER1121 Power Tools

Learning Outcomes:

- Demonstrate knowledge of identifying, selecting, operating and maintaining power tools

Duration: 24 Hours

Pre-Requisite(s): ER1410

Objectives and Content:

1. Identify types of power tools and describe their applications and procedures for service and use.
 - i. drills
 - drill bits
 - ii. drill presses
 - iii. hammers
 - iv. saws
 - v. grinders
 - vi. hydraulic tools
 - vii. pneumatic tools
2. Describe the operation of power tools.
 - i. components
 - ii. grounding
3. Identify the types of periodic maintenance testing
 - i. preventative
 - ii. predictive
 - iii. reactive

Practical Requirements:

1. Select and use a portable drill and bits for a specific task.
2. Use rotary hammer.
3. Operate a drill press.
4. Determine safe working speeds of wheels on portable and pedestal grinders.
5. Select wheels and discs for portable and pedestal grinders.
6. Operate portable and pedestal grinders.
7. Sharpen wood and metal bits.
8. Operate circular, saber and reciprocating saws.

ER1131 Fasteners

Learning Outcomes:

- Demonstrate knowledge of identifying, selecting, and installing fasteners

Duration: 15 Hours

Pre-Requisite(s): ER1121

Objectives and Content:

1. Identify types of nails and describe their applications and procedures for use.
2. Identify types of screws and bolts and describe their applications and procedures for use.
 - i. wood screws
 - ii. sheet metal screws
 - iii. machine screws and bolts
 - iv. nuts and washers
3. Identify types of anchors and shields and describe their applications and procedures for use.
 - i. masonry anchors
 - ii. cavity fasteners
 - iii. screw anchors
 - fiber
 - metal
 - lead
 - plastic
 - screw-in anchor
 - iv. miscellaneous fasteners
 - concrete screws
 - hollow rivets
 - spring-steel fasteners
 - chemical fasteners
 - self-tapping masonry screws

4. Explain the operation of explosive actuated tools.

Practical Requirements:

1. Install fasteners
2. Use powder actuated tools to fasten materials to concrete and steel.
3. Dismantle, inspect, clean and reassemble powder actuated tools.

ER1140 DC Theory

Learning Outcomes:

- Demonstrate knowledge of direct current circuit theory
- Demonstrate knowledge of calculating DC circuits
- Demonstrate knowledge of selecting and using measuring instruments

Duration: 30 Hours

Pre-Requisite(s): ER1410

Objectives and Content:

1. Identify hazards and describe safe work practices pertaining to DC electricity.
2. Describe the atomic structure of matter.
 - i. electron theory
 - matter
 - atoms
 - electric charge
 - protons, electrons, neutron
 - ii. static electricity and electrostatics
 - positive and negative charge
 - electrostatic field
 - transferring static electricity
 - conduction
 - induction
 - iii. discharging static charges
 - electrons in motion
 - causes of current
 - conductors, semi-conductors, insulators
 - electron current flow
 - conventional current flow
3. Identify electrical units and symbols.
 - i. absolute electrical units

- current
 - voltage
 - resistance
 - ii. prefixes for absolute units
- 4. 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
 - ii. effects of dynamic electricity
 - heating effects
 - chemical effects
 - magnetic effects
 - psychological and physiological effects
- 5. Identify and 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
- 6. Identify and describe the three basic electrical properties.
 - i. voltage
 - ii. current
 - iii. resistance
- 7. Explain Ohm's Law.
- 8. Describe the following in relation to electricity.
 - i. work

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

Practical Requirements:

- 1. Compute values of electrical energy and power.
- 2. Use electrical measuring instruments.
- 3. Use instruments to troubleshoot DC components
 - i. closed circuit
 - ii. open circuit
 - iii. short circuit
- 4. Ensure calibration of measuring instruments in accordance with manufacturing specifications.
- 5. Conduct megger test.

ER1151 Series and Parallel DC Circuits

Learning Outcomes:

- Demonstrate knowledge of performing calculations to determine series, parallel and complex DC circuit related values

Duration: 45 Hours

Pre-Requisite(s): ER1140

Objectives and Content:

1. Describe the characteristics of a series circuit and calculate values.
 - i. resistance
 - ii. current
 - iii. voltage
 - iv. power
 - v. open resistor
 - vi. shorted resistor

2. Describe the characteristics of a parallel circuit and calculate values.
 - i. resistance
 - ii. current
 - iii. voltage
 - iv. power
 - v. open resistor
 - vi. shorted resistor

3. Explain Kirchhoff's Laws.
 - i. current law
 - ii. voltage law

4. Describe the characteristics of a combination circuit and calculate values.

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

Practical Requirements:

1. Analyze and measure amperage and voltage in series DC circuits.
2. Analyze and measure amperage and voltage in parallel DC circuits.
3. Analyze and measure amperage and voltage in combination DC circuits.
4. Analyze and measure resistance and/or continuity in basic DC circuits.
5. Analyze and measure power consumption in basic DC circuits.

ER1160 Codes

Learning Outcomes:

- Demonstrate knowledge of understanding the structure of the Canadian Electrical Code (CEC)
- Demonstrate knowledge of understanding the structure of the National Building Code (NBC)
- Demonstrate knowledge of the procedures used to locate and interpret information in the CEC and NBC

Duration: 30 Hours

Pre-Requisite(s): None

Objectives and Content:

Canadian Electrical Code (CEC)

1. Understand and be able to use the Canadian Electrical Code (CEC).
 - i. knowledge of CEC content
 - sections
 - tables
 - diagrams
 - appendices
 - index
 - division, subdivision, etc.
 - ii. use of the CEC
 - using key words in the index
 - using table of contents
 - using subject area

2. Describe the procedures used to locate, select and gather information from the CEC handbook.
 - i. purpose of the handbook
 - ii. rationale for rules
 - iii. intent for rules

- iv. diagrams and figures

National Building Code (NBC)

- 3. Understand and be able to use the National Building Code (NBC) as it relates to the CEC.
 - i. background and purpose of the code
 - ii. preface
 - iii. table of contents
 - iv. numbering system
 - v. index
 - vi. appendix
 - vii. tables
 - viii. scope and definitions
 - ix. general requirements
 - x. use and occupancy

Practical Requirements:

- 1. Locate and select information from the CEC, Part 1.
- 2. Locate and select information from the CEC Handbook.
- 3. Locate and select information from the National Building Code (NBC).

ER1170 Voltage Drop and Power Loss

Learning Outcomes:

- Demonstrate knowledge of performing calculations on voltage drop and power loss and its impact on a circuit.

Duration: 30 Hours

Pre-Requisite(s): ER1151, ER1160

Objectives and Content:

1. Identify the types of conductor materials and describe their characteristics.
 - i. aluminum
 - ii. copper
2. Identify types of insulators and describe their characteristics and applications.
3. Explain conductor resistance and its effects on a circuit.
 - i. resistivity
 - ii. cross-sectional area
 - iii. length
 - iv. temperature coefficient of resistance
4. Describe the procedures used to determine conductor resistance.
5. Explain line voltage drop and its effects on a circuit.
 - i. factor affecting voltage drop
 - ii. calculate voltage drop
 - iii. CEC requirements
 - iv. voltage drop percentage
6. Explain power loss and its effects on a circuit.
 - i. calculate power loss

7. Describe the operation of a three-wire system.
 - i. purpose of a three-wire system
 - ii. neutral wire

Practical Requirements:

1. Use CEC tables to calculate voltage drop.
2. Calculate the absolute values in three-wire circuits.

ER1180 Single Phase Theory

Learning Outcomes:

- Demonstrate knowledge of single-phase electricity
- Demonstrate knowledge of AC components and AC circuits and their characteristics and associated principles

Duration: 60 Hours

Pre-Requisite(s): ER1170

Objectives and Content:

1. Describe the principles of magnetism and the action of magnets.
 - i. magnetic and nonmagnetic substances categories
 - magnetic and nonmagnetic substances
 - poles of a magnet and the earth
 - 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. Identify hazards and describe safe work practices pertaining to single-phase electricity.
- 5. Describe the generation of alternating current.
 - i. direction of induced voltage
 - ii. left-hand generator rule
 - iii. alternation/revolution
 - iv. cycle
 - v. sine wave/plotting
 - vi. electrical and mechanical degrees
- 6. Define different values and terms of alternating current.
 - i. alternating current values
 - instantaneous values
 - maximum (peak) values
 - peak to peak values

- effective (RMS) values
 - average values
 - ii. terminology of alternating current circuits
 - frequency / hertz
 - period
 - phase (in phase, lagging, leading)
- 7. Describe the characteristics of components found in AC 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
 - 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 circuit
 - resistive-reactive circuit
 - apparent power and reactive power
 - power factor correction
- 8. Solve RL, RC, and RLC AC series and AC parallel circuits.
 - i. circuits with resistance and inductive reactance
 - ii. circuits with resistance capacitive reactance
 - iii. circuits with resistance, inductive reactance and capacitive reactance
 - iv. power factor calculation

Practical Requirements:

1. Determine the properties of an AC circuit.
2. Connect AC series and AC parallel circuits containing RLC components.
3. Determine absolute values in AC series and AC parallel circuits containing RLC components.
4. Calculate power and power factor in AC circuits.
5. Use electrical instruments to troubleshoot series and parallel AC circuits.

ER1201 Drawings, Schematics and Specifications

Learning Outcomes:

- Demonstrate knowledge of drawings, schematics and specifications and their applications.

Duration: 30 Hours

Pre-Requisite(s): ER1160

Objectives and Content:

1. Identify types of drawings and describe their applications.
 - i. civil / site
 - ii. architectural
 - iii. mechanical
 - iv. structural
 - v. electrical
 - vi. shop drawings
 - vii. sketches
 - viii. as-builts
 - ix. piping and instrument drawings (P and ID's)
 - x. installation drawings
 - xi. loop drawings
 - xii. location drawings
 - xiii. logic drawings

2. Review and interpret information from drawings.
 - i. alphabet of lines
 - ii. elevations
 - iii. scales
 - iv. legends
 - v. symbols and abbreviations
 - vi. notes and specifications

3. Review and interpret information from basic drawings, schematics, wiring

diagrams and documents.

4. Describe procedures used to obtain material lists.

Practical Requirements:

1. Gather and interpret information from various drawings.
2. Determine measurements from scaled drawings.
3. Use information to obtain a materials list for installation.
4. Sketch basic drawing views.

ER1220 Conduit, Tubing and Fittings

Learning Outcomes:

- Demonstrate knowledge of installing various types of conduit, tubing, fittings, components and accessories.

Duration: 30 Hours

Pre-Requisite(s): ER1131

Objectives and Content:

1. Describe the various types of conduits and tubing, their characteristics and applications.
 - i. metallic rigid and EMT
 - ii. non-metallic rigid (PVC)
 - iii. flexible
2. Describe the various fittings, couplings, and device boxes used with conduits and tubing.
 - i. fittings
 - ii. couplings
 - iii. connectors
 - iv. boxes and enclosures
 - v. supporting methods
3. Describe the terms associated with the bending of conduit and tubing.
 - i. back-to-back
 - ii. 90 degree bend
 - iii. concentric bends
 - iv. “dog leg” or “kick”
 - v. gain
 - vi. leg length
 - vii. offsets
 - viii. rise on stub-up
 - ix. saddles

- x. developed length
4. Identify hazards and describe safe work practices pertaining to conduit, tubing and fittings.
 5. Identify the CEC requirements used to prepare, bend and install rigid metal conduit.
 - i. preparation
 - ii. cutting conduit by hand
 - iii. cutting conduit using power devices
 - iv. bending
 - v. reaming rigid conduit
 - vi. threading rigid conduit by hand
 - vii. machine threading
 - viii. portable power units
 - ix. hazardous locations
 6. Identify the CEC requirements used to properly prepare, bend and install EMT.
 - i. preparation
 - cutting EMT
 - reaming EMT
 - ii. bending
 - hand benders
 - mechanical benders
 - hydraulic benders
 - the little “kicker”
 - iii. installation
 - types of couplings and connectors
 - fittings
 - boxes
 7. Identify the CEC requirements used to prepare, bend and install PVC conduits.
 - i. preparation
 - ii. cutting
 - iii. fittings
 - iv. joining
 - v. bending
 - preparing for bending
 - hand held heaters

- floor model heaters
 - liquid PVC heaters
 - precautions when bending
 - prefabricated bends
 - expansion and contraction
8. Describe EMT, its applications and limitations.
- i. general information
 - ii. couplings and connectors
 - iii. CEC requirements
9. Describe EB1, DB2/ES2, their applications, limitations and installation.
- i. restrictions
 - ii. methods of installation
 - iii. CEC requirements
10. Describe flexible conduit, its applications, limitations and installation.
- i. cutting
 - ii. connectors
 - iii. CEC requirements
11. Identify the size requirements of pull boxes and junction boxes according to CEC requirements.
- i. straight pulls
 - ii. angle pulls
 - iii. U-pulls

Practical Requirements:

1. Apply proper cutting, coupling and termination methods used with conduit.
2. Install rigid metal conduit.
3. Prepare and bend EMT.
4. Install EMT.
5. Prepare and install PVC conduit.
6. Determine the size requirements of pull boxes and junction boxes.

ER1230 Conductors and Cables

Learning Outcomes:

- Demonstrate knowledge of installing and terminating conductors and cables

Duration: 45 Hours

Pre-Requisite(s): ER1220

Objectives and Content:

1. Identify terminology associated with conductors and cables.
 - i. CSA designations
 - ii. voltage ratings
 - iii. number and size range of conductors
 - iv. number of strands
 - v. conditions of use
 - vi. allowable ampacity
 - vii. temperature ratings
2. Identify hazards and describe safe work practices pertaining to conductors and cables.
3. Identify the CEC requirements used to select and install flexible cords and equipment wire.
 - i. applications
 - ii. CSA designations
 - iii. voltage ratings
 - iv. number and size range of conductors
 - v. construction
 - vi. conditions of use
 - vii. allowable ampacity
 - viii. temperature ratings
 - ix. installation
 - x. terminations

4. Identify the CEC requirements used to select and install TECK and tray cables.
 - i. applications
 - ii. CSA designations
 - iii. voltage ratings
 - iv. number and size range of conductors
 - v. construction (outer covering and conductor insulation)
 - vi. conditions of use
 - vii. allowable ampacity
 - viii. temperature ratings
 - ix. installation
 - x. terminations
 - xi. sheath currents
 - xii. hazardous location fittings and terminations

5. Identify the CEC requirements used to select and install MI cables.
 - i. applications
 - ii. CSA designations (MI or LWMI)
 - iii. voltage ratings
 - iv. number and size range of conductors
 - v. construction (copper, aluminum, or stainless steel)
 - vi. conditions of use
 - vii. allowable ampacity
 - viii. temperature ratings
 - ix. installation
 - x. terminations and splices
 - xi. sheath currents
 - xii. high voltage surges
 - xiii. fault location

6. Describe the preparation of conductors for installation in raceways.
 - i. CEC requirements
 - ii. conductor lubricants
 - iii. identification and colour coding of conductors
 - iv. equipment preparation

7. Describe the mechanical procedures used to install conductors in raceways.
 - i. installing fish tapes
 - ii. use of jet line and air pressure
 - iii. vacuum fishing

- iv. fish lines and ropes
 - v. adding conductors to existing conduit
 - vi. installation of conductors in flexible conduit
8. Describe the procedures used to set reels on jacks and stands.
9. Describe the installation of conductors in raceways with power equipment.
- i. mechanical pullers
 - ii. power drives for cable pulling
 - iii. pulleys, rollers, and extended sheaves
 - iv. attachment of conductors to pull cords
10. Locate and interpret CEC requirements related to the installation of conductors in raceways.
- i. allowable ampacity
 - ii. temperature ratings
 - iii. protection of conductors at the ends of raceways
 - iv. radii of bends in raceways
 - v. number of conductors in conduit and tubing

Practical Requirements:

- 1. Prepare and install conductors in raceways.
- 2. Set reels on jacks and stands.
- 3. Select and terminate MI cables.
- 4. Select and terminate armored cables.
- 5. Select and terminate TECK cables.
- 6. Select and terminate aluminum sheathed cables.
- 7. Apply CEC requirements in respect to the installation of conductors and cables.
- 8. Determine size of device and junction boxes.

ER1241 Fundamental Wiring

Learning Outcomes:

- Demonstrate knowledge of wiring applications and their associated devices and components
- Demonstrate knowledge of installing basic wiring devices according to CEC requirements

Duration: 60 Hours

Pre-Requisite(s): ER1230

Objectives and Content:

1. Identify the procedures to follow when doing an electrical installation.
 - i. drawings and specifications
 - ii. rough-in and distribution
 - iii. termination procedures and inspections
2. Identify hazards and describe safe work practices pertaining to basic wiring applications.
3. Describe the procedures used to strip and splice wires.
 - i. stripping wires with proper tools
 - ii. common wire splices
4. Identify mechanical connectors and compression tools and describe their applications.
 - i. twist-on connectors
 - ii. pressure type terminals and connectors (crimp)
5. Identify lampholders and describe their connections.
 - i. types of lampholders
 - screw base sizes
 - ii. connection of lampholders

6. Identify types of switches and describe their applications and connections.
 - i. types of switches
 - toggle, decorative, key, etc.
 - single pole
 - three-way
 - four-way
 - pilot light
 - door
 - dimming control
 - motion sensor
 - ii. construction and rating of switches
 - iii. switches applications
 - single pole connection
 - three-way connection
 - four-way connection

7. Identify types of receptacles and describe their applications and connections.
 - i. types of receptacles
 - CSA configurations
 - tamper-proof
 - ground fault interrupter receptacle
 - T-slot receptacle
 - ii. split receptacle
 - split-switched duplex receptacle
 - split-receptacle for two 15A outlets
 - iii. receptacle grounding

8. Identify types of boxes and describe their applications and procedures for installation.
 - i. types of boxes
 - junction, device and outlet boxes
 - ganged boxes
 - types of cover plates
 - ii. mounting methods of boxes.
 - iii. maximum number of conductors in boxes.
 - iv. CEC requirements

9. Identify types of nonmetallic sheathed cables, and describe their standards and procedures for installation.

- i. types of cables
 - NMD90
 - NMWU
 - ii. applications
 - iii. stripping
 - iv. termination
 - v. CEC requirements
10. Identify armored cables and describe their standards and procedures for installation.
- i. AC90
 - ii. stripping
 - iii. termination
 - iv. CEC requirements
11. Identify extra low voltage wiring and procedures for installation.
- i. door bell
 - ii. lighting control
 - iii. heating control
12. Describe the procedures used to protect cables.
- i. mechanical damage
 - CEC requirements
 - ii. overcurrent protection devices
 - fuses
 - breakers
 - GFCI breakers
 - arc fault breakers
 - surge protection breakers
13. Describe the procedures used to install switches.
- i. single-pole switch
 - source feed to the switch
 - source feed to the light
 - ii. pilot light switch
 - source feed to the switch
 - source feed to the light
 - iii. three-way and four-way switches
 - source feed to the three-way switch

- source feed to the light
 - light between the two switches
 - all other types of circuit configurations
14. Identify the CEC requirements used to install receptacles.
- i. split-switched duplex receptacle
 - ii. split-receptacle for two 15A outlets
 - iii. mixed circuit with split-switched duplex receptacle and lights
15. Identify and describe installation standards and types of lighting equipment control devices.
- i. general lighting circuits
 - CEC requirements
 - ii. lighting controls and timers
 - iii. installation and wiring of lighting equipment
16. Identify and describe residential ventilation system electrical connections.
- i. kitchen exhaust fans
 - ii. bathroom fans
17. Describe the installation of water pumps and electric water heaters.
- i. water pumps
 - jet or piston pump
 - submersible pump
 - ii. electric water heaters
 - storage tank water heater
 - tankless water heater
18. Identify the CEC requirements for the installation of lighting equipment.
- i. general characteristics
 - ii. location
 - iii. installation
 - iv. wiring
 - v. lampholder characteristics
19. Identify the CEC requirements for the installation of overcurrent protection devices.
- i. fuses

- ii. circuit breakers
 - iii. switches
 - iv. miscellaneous apparatus
20. Identify the CEC requirements for the installation of receptacles.
- i. receptacles in residential occupancies
 - ii. branch circuits in residential occupancies
 - iii. portable electric heating devices and cooking appliances
21. Identify the CEC requirements for the installation of pools, tubs and spas.

Practical Requirements:

1. Determine the branch circuit requirements for a dwelling unit according to the CEC.
2. Determine lighting and switching requirements for a dwelling unit according to the CEC and NBC.
3. Space, locate and install convenience outlets according to CEC.
4. Locate and determine the circuit requirements and install specific-use outlets according to the CEC.
5. Install a door bell/door chime system.
6. Install cables in a concealed space.
7. Conduct acceptable rough-in and finish-up.

ER1250 Protective Devices

Learning Outcomes:

- Demonstrate knowledge of selecting and installing all appropriate protective devices as per CEC requirements

Duration: 30 Hours

Pre-Requisite(s): ER1230

Objectives and Content:

1. Describe the function of protective devices.
 - i. overcurrent
 - ii. overload
 - iii. short circuit
2. Identify hazards and describe safe work practices pertaining to protective devices.
3. Describe the effects of short-circuit current.
 - i. fault currents
 - ii. percent impedance
 - iii. types of damage
4. Describe overcurrent devices, their characteristics and applications
 - i. voltage
 - ii. current
 - iii. interrupting capacity
 - iv. time-current characteristics
5. Identify types of fuses and disconnects, and describe their characteristics and applications.
 - i. screw-base plug fuses
 - ii. standard cartridge fuses
 - iii. renewable link fuses
 - iv. high rupture capacity fuses

- v. time delay fuses
 - vi. classifications of fuses
6. Identify types of low-voltage circuit breakers and describe their characteristics and applications.
- i. thermal trip action
 - ii. magnetic trip action
 - iii. moulded case
 - iv. high interrupting capacity type
 - v. ground fault interrupters
 - vi. arc fault circuit interrupters
 - vii. surge suppression
7. Identify the CEC requirements for the selection of protective devices.
8. Describe the coordination of protective devices.
- i. manufacturer's chart
 - ii. engineer's responsibilities
 - iii. electrician's responsibilities
9. Describe the procedures used to troubleshoot and maintain protective devices.

Practical Requirements:

- 1. Select fuses/breakers according to specific requirements and CEC requirements.
- 2. Determine interrupting capacity requirements of fuses/breakers.

ER1540 Single Phase Transformers

Learning Outcomes:

- Demonstrate knowledge of installing, connecting, and troubleshooting single phase transformers.

Duration: 30 Hours

Pre-Requisite(s): ER1180, ER1250

Objectives and Content:

1. Identify hazards and describe safe work practices pertaining to transformers.
2. Define terminology associated with transformers.
3. Interpret codes and regulations pertaining to transformers.
4. Interpret information pertaining to transformers found on drawings and specifications.
5. Identify tools and equipment relating to transformers and describe their applications and procedures for use.
6. Explain the operating principles of transformers.
 - i. mutual induction
 - ii. turns ratio
 - iii. classes of transformers
 - iv. high-voltage windings
 - v. low-voltage windings
 - vi. core designs
7. Interpret information contained on transformer nameplates.
8. Describe transformer polarity and terminal markings.
 - i. additive and subtractive polarity

- ii. polarity tests
9. Describe various connections for multi-coil transformers.
- i. double-wound transformers
 - ii. series/parallel connections
10. Describe the use of schematic diagrams to illustrate how single-phase transformers are connected for parallel operation.
- i. connections for paralleling dual-winding transformers
 - ii. back-feed hazard

Practical Requirements:

- 1. Perform polarity tests.
- 2. Measure transformer voltage/current ratios.
- 3. Conduct operational tests pertaining to transformers.
- 4. Perform transformer related calculations.
 - i. turns/voltage/current ratios
 - ii. voltage, current and KVA calculations

ER1270 Single-Phase Service Entrance

Learning Outcomes:

- Demonstrate knowledge of overhead and underground single-phase service entrances, their applications and operation
- Demonstrate knowledge of installing, connecting, troubleshooting and maintaining single-phase service entrances
- Demonstrate knowledge of installing and connecting overhead single-phase service entrances
- Demonstrate knowledge of calculating demand factor

Duration: 30 Hours

Pre-Requisite(s): ER1261

Objectives and Content:

1. Identify hazards and describe safe work practices pertaining to single-phase service entrances.
2. Define terminology associated with single-phase service entrances.
3. Interpret codes, regulations and utility drawings pertaining to single-phase service entrances.
4. Interpret information pertaining to single-phase service entrances found on drawings and specifications.
5. Identify sources of information and documentation required for the installation of single-phase service entrances.
6. Identify tools and equipment relating to single-phase service entrances and describe their applications and procedures for use.
7. Identify types of single-phase service entrances and describe their characteristics

and applications.

- i. temporary service
 - ii. overhead
 - iii. underground
 - iv. multiple metering
8. Identify single-phase service entrance components and accessories and describe their characteristics and applications
- i. service entrance mast
 - ii. meter connection box
 - iii. main switch and panelboard
 - iv. underground service box
9. Describe the different methods of grounding and bonding
- i. grounding electrodes types
 - ii. grounding conductors
 - iii. bonding conductors
10. Calculate demand factors.

Practical Requirements:

1. Determine service layout and equipment/materials required.
2. Install a single-phase, three wire distribution system.
3. Install single-phase service entrance equipment.
4. Install grounding and bonding electrodes and conductors.

ER1550 Demand Factor and Device Layout

Learning Outcomes:

- Demonstrate knowledge of calculating demand factors for a single family dwelling based on Sections 8-100 to 8-200 of the Canadian Electrical Code (CEC)
- Demonstrate knowledge of calculating heat loss and device layout as per the CEC and NBC for a single family dwelling based on Sections 8-100 to 8-200 of the Canadian Electrical Code (CEC).

(NOTE: This is a project course.)

Duration: 30 Hours

Pre-Requisite(s): ER1160, ER1270

Practical Requirements:

1. Calculate and layout electrical devices using a floor plan of a single family dwelling as per the Canadian Electrical Code (CEC) and the National Building Code (NBC). Include:
 - iii. Heat loss calculation
 - iv. Service ampacity
 - v. Conductor and conduit size
 - vi. Grounding
 - vii. Device layout

ER1370 Distribution Equipment

Learning Outcomes:

- Demonstrate knowledge of installing and connecting various types of distribution equipment as per CEC requirements

Duration: 20 Hours

Pre-Requisite(s): ER1270

Objectives and Content:

1. Identify hazards and describe safe work practices pertaining to distribution equipment.
2. Define terminology associated with distribution equipment.
3. Interpret codes and regulations pertaining to distribution equipment.
4. Interpret information pertaining to distribution equipment found on drawings and specifications.
5. Identify tools and equipment relating to distribution equipment and describe their applications and procedures for use.
6. Identify types of distribution equipment and describe their characteristics and applications.
 - i. enclosure types (NEMA/EEMAC/CSA designations)
 - ii. disconnect switches and switchgear (voltage and current ratings)
 - iii. low voltage switchboards
 - iv. motor control centers
 - v. panel boards
 - distribution panel boards and loadcenters
 - ratings
 - main lugs/breakers
 - pole positions

- breaker mounting options
 - typical IC ratings of breaker
 - branch circuit breaker ratings
 - service (voltage and frequency)
 - integrated tvss systems
 - fusible panel board
7. Identify distribution equipment components and accessories and describe their characteristics and applications.
 8. Identify the considerations and requirements for selecting distribution equipment, its components and accessories.
 9. Describe the procedures used to install and connect distribution equipment, its components and accessories.

ER1360 Electric Heating Systems and Controls

Learning Outcomes:

- Demonstrate knowledge of selecting and installing electric heaters and controls
- Demonstrate knowledge of installing wiring for electric heating systems

Duration: 30 Hours

Pre-Requisite(s): ER1370

Objectives and Content:

1. Identify hazards and describe safe work practices pertaining to electric heating systems and controls.
2. Identify various types of electric heating systems and describe their components and procedures for installation as per CEC requirements.
 - i. baseboard heaters
 - uses
 - ratings
 - heating method
 - ii. radiant heating
 - cable sets
 - temperature control
 - spacing / CSA and manufacturer's installation procedures
 - inspection and test procedure
 - heating panels
 - iii. forced air and convection heaters
 - fan forced heaters (wall / floor / ceiling)
 - over temperature protection (liner - snap disc)
 - convector type unit
 - iv. thermostats and relays
 - use of low voltage thermostats and relays
 - thermostats operation (bimetal, hydraulic filled, solid state)
 - line voltage thermostats (single-pole, double pole, built-in)

- programmable thermostats
 - magnetic, thermal and solid state relays
3. Perform heat loss calculations for a given space.

Practical Requirements:

1. Install forced air heaters.
2. Install a baseboard heater with relay and low-voltage thermostat control.
3. Install a baseboard heater with built-in thermostat control.
4. Install a baseboard heater with a wall mounted line-voltage thermostat control.
5. Install and program a programmable thermostat.

ER1410 Safety Practices

Learning Outcomes:

- Demonstrate knowledge and awareness of safe work practices in the workplace

Duration: 30 Hours

Pre-Requisite(s): None

Objectives and Content:

1. Describe basic employer and employee duties to comply with the applicable Act and safety regulations. (91-448 of OH&S Regulations)
 - i. employers responsibilities
 - ii. supervisors responsibilities
 - iii. employees rights and responsibilities
 - iv. Health and Safety Committee responsibilities
2. Describe practices used to control workplace hazards.
 - i. identification of hazards
 - ii. hazard assessment
 - iii. housekeeping
 - iv. fire extinguishers
 - v. incident investigations
 - vi. formal inspections
 - vii. regular safety meetings
 - viii. tool box meetings
3. Identify personal protective equipment (PPE) and describe procedures for use and care.
4. Describe safety practices when working in and around trenches.
5. Describe safe practices when working with tools and equipment.
6. Describe mobile equipment safety practices.

7. Identify types of access equipment and describe their construction and safe working practices.
 - i. ladders
 - ii. scaffolds
 - iii. man lifts

8. Describe potential hazards while working around welding areas.
 - i. harmful gases
 - ii. flashing
 - iii. burns
 - iv. grounding

9. Describe confined space safety practices.

10. Describe lifting techniques, work posture and ergonomics.

11. Describe safety measures related to electricity.
 - i. CSA - Workplace Electrical Safety (Standard) Z462-08

12. Describe safety measures for lockout and tagging of equipment.

Practical Requirements:

1. Perform isolation and de-energizing procedures and lockout / tag out.
2. Safely erect ladders and scaffolding.
3. Properly inspect and use fall arrest equipment.
4. Identify and tag out faulty equipment.

ER2421 Heat Pumps and HVAC Electrical Systems

Learning Outcomes:

- Demonstrate knowledge of connecting heat pumps and their associated devices as per CEC requirements
- Demonstrate knowledge of connecting HVAC electrical systems and their associated devices as per CEC requirements

Duration: 20 Hours

Pre-Requisite(s): ER1360

Objectives and Content:

1. Locate and interpret information related to heat pumps and HVAC electrical systems and their installations.
 - i. drawings and symbols
 - ii. schematics
 - iii. manufacturer's specifications
2. Describe the basic operating principles of heat pumps and HVAC electrical systems.
3. Describe the operation and connection of heating / cooling thermostats in HVAC electrical systems.
4. Describe the procedures used to install heat pump power and control wiring and overcurrent / disconnect devices as per CEC requirements.
5. Describe generic maintenance procedures for heat pumps and HVAC electrical systems and the procedures used to document work performed.
6. Describe the procedures used to conduct operational tests pertaining to HVAC electrical systems.

Practical Requirements:

1. Code-related exercise related to installation of heat pumps and HVAC power and control electrical systems.

CM2150 Workplace Communications

Learning Outcomes:

- Demonstrate knowledge of understanding and applying communication skills as outlined in the Employability Skills 2000, Conference Board of Canada
- Demonstrate knowledge of understanding the importance of well-developed writing skills in business and in career development
- Demonstrate knowledge of understanding the purpose of the various types of business correspondence
- Demonstrate knowledge of examining the principles of effective business writing
- Demonstrate knowledge of examining the standard formats for letters and memos
- Demonstrate knowledge of writing effective letters and memos
- Demonstrate knowledge of examining the fundamentals of informal reports and the report writing procedure
- Demonstrate knowledge of producing and orally presenting an informal report
- Demonstrate knowledge of examining effective listening skills and body language in communication

Duration: 45 Hours

Pre-Requisite(s): 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 as referenced in the Employability Skills
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
 - i. prepare for giving presentations
8. Interpersonal communications.
- i. examine and apply listening techniques
 - ii. discuss the importance of body language

Practical Requirements:

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

Learning Outcomes:

- Demonstrate knowledge of understanding what defines customer service
- Demonstrate knowledge of understanding why service is important
- Demonstrate knowledge of understanding the relationship between “service” and “sales.
- Demonstrate knowledge of understanding the importance of a positive attitude
- Demonstrate knowledge of understanding the methods of resolving customer complaints

Duration: 30 Hours

Pre-Requisite(s): 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 Requirements:

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

SP2330 Quality Assurance/Quality Control

Learning Outcomes:

- Demonstrate knowledge of applying quality assurance/quality control procedures as related to the trade.
- Demonstrate knowledge and awareness of quality principles and processes.
- Demonstrate knowledge of applying quality assurance/quality control procedures in a shop project.

Duration: 30 Hours

Pre-Requisite(s): 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 Requirements:

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

Learning Outcomes:

- Demonstrate knowledge of computer systems and their operation.
- Demonstrate knowledge of popular software packages and their applications.
- Demonstrate knowledge of security issues of computers.

Duration: 30 Hours

Pre-Requisite(s): 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 resolution, background
 - 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 form 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 Requirements:

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

Learning Outcomes:

- Demonstrate knowledge of participating in meetings
- Demonstrate knowledge of basic concepts of the workplace such as unions, workers' compensation, workers' rights, human rights, workplace diversity, and gender sensitivity.

Duration: 30 Hours

Pre-Requisite(s): 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 Requirements:

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

Learning Outcomes:

- Demonstrate knowledge of effective use of job search techniques

Duration: 15 Hours

Pre-Requisite(s): None

Objectives and Content:

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 Requirements:

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

Learning Outcomes:

- Demonstrate knowledge of understanding the various types of business ownership
- Demonstrate knowledge of understanding the advantages and disadvantages of self-employment
- Demonstrate knowledge of identifying the characteristics of an entrepreneur
- Demonstrate knowledge of stating the purpose of a business plan
- Demonstrate knowledge of identifying the main elements of a business plan

Duration: 15 Hours

Pre-Requisite(s): 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

OT1230 Workplace Exposure

Learning Outcomes:

- Demonstrate knowledge of theory and practical applications of trade skills, safe work practices, appropriate workplace behaviour and time management through exposure to the trade in an authentic work environment

NOTE: The pre-apprentice must be supervised at the workplace. Supervision staff must be appropriately qualified to undertake that role – preferably a certified Journeyman for the trade.

Duration: 60 Hours

Pre-Requisite(s): None

MA1060 Basic Math

Learning Outcomes:

- Demonstrate knowledge of numeracy skills and knowledge required for institutional and on-the-job learning
- Demonstrate knowledge of applying mathematical concepts in the performance of trade practices
- Demonstrate knowledge of developing an appreciation for mathematics as a critical element of the learning environment
- Demonstrate knowledge of using 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.

Duration: 60 Hours

Pre-Requisite(s): None

Objectives and Content:

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.

AP1100 Introduction to Apprenticeship

Learning Outcomes:

- Demonstrate knowledge of describing the apprenticeship registration process
- Demonstrate knowledge of explaining the steps to complete the Apprenticeship Program
- Demonstrate knowledge of understanding the roles of the Apprentice, Journeyman, Training Institutions, Industry and Governing Bodies in the Apprentice Program
- Demonstrate knowledge of explaining the significance of the Interprovincial Standards Red Seal Program

Duration: 15 Hours

Pre-Requisite(s): 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 administering apprenticeship
 - Department of Advanced Education and Skills
 - Provincial Apprenticeship and Certification Board
3. Explore the roles and responsibilities of those involved in the apprenticeship process.
 - i. apprentice
 - ii. employer/journeyman
 - 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 applicant's training institution
 - vi. describe the roles of Apprenticeship and Trades Certification Division of the Department of Advanced Education and Skills 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 the 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 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. Journeyperson
 - 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 Requirements:

1. Review the Provincial Apprenticeship web site: 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

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

B. 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 Apprenticeship and Trades Certification, 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 Apprenticeship and Trades Certification, 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

Progression Schedule

Residential Electrician 4800 Hours			
APPRENTICESHIP LEVEL AND WAGES			
Year	Wage Rate At This Level	Requirements for progression to next level of apprenticeship	When requirements are met, the apprentice will progress to...
1 st	60 %	<ul style="list-style-type: none"> ▪ Completion of Block 1 (pre-employment) training ▪ Pass Block 1 exam ▪ Relevant work experience totaling 1600 hours or more 	2 nd Year
2 nd	75%	<ul style="list-style-type: none"> ▪ Relevant work experience totaling 3200 hours or more 	3 rd Year
3 rd	90%	<ul style="list-style-type: none"> ▪ Relevant work experience totaling 4800 hours or more ▪ Sign-off of all workplace skills in apprentice logbook ▪ Pass certification exam 	Journeyman Certification
<p>Wage Rates</p> <ul style="list-style-type: none"> ▪ Rates are percentages of the prevailing journeyman's wage rate in the place of employment of the apprentice. ▪ Rates must not be less than the wage rate established by the Labour Standards Act (1990), as now in force or as hereafter amended, or by other order, as amended from time to time replacing the first mentioned order. ▪ Rates must not be less than the wage rate established by any collective agreement which may be in force at the apprentice's workplace. ▪ Employers are free to pay wage rates above the minimums specified. <p>Block Exams</p> <ul style="list-style-type: none"> ▪ This program may not currently contain Block Exams, in which case this requirement will be waived until such time as Block Exams are available. 			

Instrumentation and Control Technician 7200 Hours		
CLASS CALLS		
Call Level	Requirements for Class Call	Hours awarded for In-School Training
Direct Entry PLA or Apprentice	<ul style="list-style-type: none"> ▪ Minimum of 1000 hours of relevant work experience ▪ Prior Learning Assessment (PLA) at designated college (if applicable) ▪ Completion of Entry level Construction / Industrial Electrician (if applicable) 	To be determined by the number of courses completed after each class call
<p>Direct Entry Apprentice</p> <ul style="list-style-type: none"> ▪ Must complete Block 1 courses through PLA and / or in school training. ▪ Block 1 training is to be completed via class calls; up to 16 weeks of training per calendar year. <p>Class Calls at Minimum Hours</p> <ul style="list-style-type: none"> ▪ Class calls may not always occur at the minimum hours indicated. Some variation is permitted to allow for the availability of training resources and apprentices. 		

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 Apprenticeship and Trades Certification 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. A mark of 70% must be attained in both the theory examination and the practical project assignment, where applicable as documented on an official transcript.
- 7.4 Course credits may be granted through the use of a PACB approved matrix which identifies course equivalencies between designated trades and between current and historical Plans of Training for the same trade.

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 Apprenticeship and Trades Certification 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. 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 Advanced Education and Skills within 30 days of the decision.

C. Requirements for Provincial Certification for Apprentices

1. Evidence the required work experiences outlined in this Plan of Training have been obtained. This evidence must be in a format clearly outlining 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 totaling 4800 hours.
4. Completion of a Provincial examination, to be set at a place and time determined by the Apprenticeship and Trades Certification Division.

D. 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 journeyman.
- 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, Apprenticeship and Trades Certification 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 and Trades Certification 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.