
NL Curriculum Standard Plan of Training Residential Electrician



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

December 2011

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

Preface

This curriculum standard outlines the curriculum content for the Residential Electrician provincial apprenticeship training program.

Acknowledgements

The Provincial Trade Advisory Committee (PTAC), industry representatives, instructors and apprenticeship staff provided valuable input to the development of this provincial plan of training. Without their dedication to quality apprenticeship training, this document could not have been produced.

We offer a sincere thank you.

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Document Status	Date Approved	Mandatory Implementation Date	Comments
New	December 2011	September 2011	
Update	July 2012	September 2012	Updated Related Suite courses
Update	March 2019	September 2019	Updated Related Suite courses

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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 as documented on an official transcript.

The order of course delivery within each level can be determined by the training institution, as long as pre-requisite and co-requisite conditions are satisfied.

Upon completion of a training program, individuals may be required to complete other certifications (employer or job site specific) in order to gain employment.

Pre-Employment				
Course No.	IPG No.	Course Name	Hours	Pre-Requisite(s)
TS1520	-	WHMIS	6	None
TS1530	-	Standard First Aid	14	None
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	None
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

Pre-Employment				
Course No.	IPG 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 ER1250
ER1270	-	Single-Phase Service Entrance	30	ER1261
ER1550	-	Demand Factor and Device Layout	30	ER1270 ER1160
ER1370	-	Distribution Equipment	20	ER1280
ER1360	-	Electric Heating Systems and Controls	30	ER1370
ER1410	-	Safety Practices	30	None
ER2421		Heat Pumps and HVAC Electrical Systems	20	ER1360
AM1000	-	Introduction to Essential Skills	9	None
AP1102	-	Introduction to Apprenticeship	12	None
*AM1101	-	Math Essentials	42	None
AM1161	-	Electrician Math Fundamentals	42	AM1101
CM2161	-	Communication Essentials	36	None

Pre-Employment				
Course No.	IPG No.	Course Name	Hours	Pre-Requisite(s)
SD1761	-	Workplace Essentials	24	None
MC1062	-	Computer Essentials	15	None
OT1230	-	Workplace Exposure	60	None
Total Course Credit Hours			924	

*A student who can meet the mathematics requirement through an ACUPLACER® test may be exempted from AM1101 - Math Essentials. Please check with your training institution.

Required Work Experience

LEVEL 1

TS1520 Workplace Hazardous Materials Information System (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 and use of the 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 the structure of the Canadian Electrical Code (CEC) and the procedures used to locate and interpret information.
- Demonstrate knowledge of the structure of the National Building Code (NBC) and the procedures used to locate and interpret information.

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, AC components, 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 IDs)
 - 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 ENT, 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
 - LWMI
 - iii. voltage ratings
 - iv. number and size range of conductors
 - v. construction
 - copper
 - aluminum
 - 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, 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, installation, connection, troubleshooting and maintenance.
- Demonstrate knowledge of installing and connecting overhead single-phase service entrances.
- Demonstrate knowledge of demand factor calculations.

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).

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 the following:
 - i. heat loss calculation
 - ii. service ampacity
 - iii. conductor and conduit size
 - iv. grounding
 - v. device layout

*(**NOTE:** This is a project course.)

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): ER1280

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
 - current ratings
 - iii. low voltage switchboards
 - iv. motor control centers
 - v. panel boards
 - distribution panel boards and load centers
 - 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.

Practical Requirements:

None.

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): Block III

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 heat pumps and HVAC electrical systems.

Practical Requirements:

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

AM1000 Introduction to Essential Skills

Learning Outcomes:

- Demonstrate knowledge of the nine nationally recognized essential skills.
- Demonstrate knowledge of the essential skills levels of complexity.
- Demonstrate knowledge of the essential skills required for the learners chosen trade.
- Demonstrate an awareness of essential skills assessments.

Duration: 9 Hours

Pre-Requisite(s): None

Objectives and Content:

1. Identify and describe the essential skills recognized by the Government of Canada through the Office of Literacy and Essential Skills (OLES).
 - i. reading
 - ii. document use
 - iii. numeracy
 - iv. writing
 - v. oral communication
 - vi. working with others
 - vii. thinking
 - viii. computer use
 - ix. continuous learning
2. Describe the Levels of Complexity measurement assigned to essential skills.
3. Identify the essential skills, along with their complexity level, identified as necessary for the learner's trade.
 - i. RSOS / NOA content¹
 - ii. OLES Essential Skills Profiles²
 - iii. OLES tools and support for apprentices and tradespersons³
4. Describe the nature and purpose of essential skills assessment.
 - i. self-assessment & formal assessment tools
 - ii. indicators of deficiencies
 - iii. suggestions for improvement

5. Describe the benefits of essential skills improvement.
 - i. confidence at work
 - ii. employability
 - iii. success in apprenticeship
 - iv. wage & job advancement

Practical Requirements:

1. Complete an essential skills self-assessment addressing numeracy, document use and reading. The online **Government of Canada Essential Skills Indicator⁴ and Essential Skills self-assessment for the trades⁵** are to be used unless the instructor provides a similar assessment tool or tools.
2. Participate in a group discussion about the impact of gaps in essential skills that may be revealed by the self-assessments completed, and the value of improving essential skills.

*Students are graded complete or incomplete on this practical work, no grade is permitted for self-assessment performance. However, completion of the practical requirements is mandatory for completion of this unit.

Resources:

All footnotes are in the companion document “Resources for Introduction to Essential Skills” which is available online from Apprenticeship and Trade Certification.

AP1102 Introduction to Apprenticeship

Learning Outcomes:

- Demonstrate knowledge of how to become a registered apprentice.
- Demonstrate knowledge of the steps to complete an apprenticeship program.
- Demonstrate knowledge of various stakeholders in the apprenticeship process.
- Demonstrate knowledge of the Red Seal Program.

Duration: 12 Hours

Pre-Requisite(s): None

Objectives and Content:

1. Define terminology associated with apprenticeship.
 - i. apprentice
 - ii. registered apprentice
 - iii. trade qualifier
 - iv. journeyperson
 - v. certified journeyperson
 - vi. Certificate of Apprenticeship
 - vii. Certificate of Qualification
 - viii. dual certification
 - ix. compulsory trades

2. Explain the roles and responsibilities of those involved in the apprenticeship system in Newfoundland and Labrador.
 - i. registered apprentice
 - ii. training institution
 - iii. employer
 - iv. journeyperson
 - v. mentor
 - vi. Department of Immigration, Skills and Labour
 - Industrial Training section
 - Standards and Curriculum section
 - vii. Provincial Trade Advisory Committees (PTAC)
 - viii. Provincial Apprenticeship and Certification Board (PACB)

3. Describe the training components of an apprenticeship.
 - i. in-school
 - Pre-employment / Level 1
 - advanced levels
 - ii. workplace experience

4. Explain the steps in the registered apprenticeship process.
 - i. meet entrance requirements
 - education
 - employment
 - Recognition of Prior Learning (RPL) - if applicable
 - ii. complete the registration process
 - application
 - required documents
 - iii. complete the Memorandum of Understanding (MOU)
 - contract responsibilities
 - probation period
 - cancellation
 - iv. maintain Record of Occupational Progress (Logbook)
 - sign off skills
 - record hours
 - update Apprenticeship Program Officer (APO) on progress
 - v. class calls
 - hour requirements
 - EI eligibility
 - training schedule
 - vi. level examinations - if applicable
 - vii. progression schedule
 - apprenticeship level
 - wage rates
 - viii. certification examinations
 - Provincial
 - Interprovincial
 - written
 - practical - if applicable
 - ix. certification
 - Certificate of Apprenticeship
 - Certificate of Qualification
 - Provincial journeyman - Blue Seal
 - Interprovincial journeyman - Red Seal endorsement (RSE)

5. Identify the Conditions Governing Apprenticeship.

6. Discuss cancellation of apprenticeship.
 - i. failure to notify of address change
 - ii. extended periods of unemployment
 - iii. lack of contact with an APO for an extended period
 - iv. failure to respond to class calls
 - v. declining of multiple class calls

7. Explain the Interprovincial Standards Red Seal program.
 - i. designated Red Seal trades
 - ii. the Red Seal Occupational Standard (RSOS)
 - iii. relationship of RSOS to IP examination
 - iv. national qualification recognition and mobility

8. Identify the current financial incentives available to apprentices.
 - i. Federal
 - ii. Provincial

9. Explain the Provincial / Territorial Apprentice Mobility Guidelines.
 - i. temporary mobility
 - ii. permanent mobility

10. Describe Atlantic and National Harmonization initiatives.

Practical Requirements:

1. Use the Provincial Apprenticeship and Trades Certification website at www.gov.nl.ca/atcd
 - i. locate, download, and complete the Application for Apprenticeship and Memorandum of Understanding (MOU)
 - ii. locate the address of the Industrial Training office closest to this campus
 - iii. locate the training schedule and identify the start date of the next class call for this trade
 - iv. locate and review the learning resources applicable to this trade
 - Study Guide
 - Exam Preparation Guide
 - Plan of Training

2. Use the Plan of Training applicable to this trade.
 - i. locate the hours for the trade
 - total in-school
 - total required for certification
 - ii. locate the number of levels
 - iii. locate the courses in each level
 - iv. locate the hours required for progression to a Level 2 apprentice and the wage percentage of that level

AM1101 Math Essentials

Note: It is recommended that AM1101 be delivered in the first semester of the Pre-employment program.

Learning Outcomes:

- Demonstrate knowledge of essential numeracy skills.
- Demonstrate knowledge of mathematics as a critical element of the trade environment.
- Demonstrate knowledge of mathematical principles in trade problem solving situations.
- Demonstrate the ability to solve simple mathematical word problems.

Duration: 42 Hours

Pre-Requisite(s): None

Objectives and Content:

Wherever possible, the instructor is expected to use trade specific examples to reinforce the course objectives.

1. Describe whole number operations.
 - i. read, write, count, round off, add, subtract, multiply and divide whole numbers.
2. Describe the application of the order of operations in math problems.
3. Describe fraction and mixed number operations.
 - i. read, write, add, subtract, multiply and divide fractions.
4. Describe decimal operations.
 - i. read, write, round off, add, subtract, multiply and divide decimals.
5. Describe percent/decimal/fraction conversion and comparison.
 - i. convert between fractions, decimals and percents.
6. Identify percentage operations.
 - i. read and write percentages
 - ii. calculate base, rates and percentages

7. Identify ratio and proportion operations.
 - i. use a ratio comparing two quantities with the same units
 - ii. use a proportion comparing two ratios

8. Describe the use of the imperial measurement system in math problems.
 - i. identify units of measurement
 - length
 - mass
 - area
 - volume
 - capacity

9. Describe the use of the metric measurement system in math problems.
 - i. identify units of measurement
 - length
 - mass
 - area
 - volume
 - capacity

10. Identify angles, lines and geometric shapes.
 - i. use a protractor to measure angles
 - ii. determine whether an angle is right, acute or obtuse
 - iii. identify parallel, perpendicular, horizontal and vertical lines
 - iv. identify types of triangles, quadrilaterals, and 3-dimensional shapes

11. Describe estimation strategies.
 - i. estimate a linear measure using a referent
 - ii. estimate length, area and volume of objects in metric and imperial systems

12. Describe problem solving that involves linear measurement using instruments such as rulers or tape measures, in the metric and imperial systems.

Practical Requirements:

1. To emphasize or further develop specific knowledge objectives, students will be required to complete practical demonstrations, which confirm proper application of mathematical theory to job skills.

AM1161 Electrician Math Fundamentals

Learning Outcomes:

- Demonstrate knowledge of mathematical concepts in the performance of trade practices.
- Demonstrate knowledge of mathematics as a critical element of the trade environment.
- Solve mathematical word problems.
- Demonstrate knowledge of mathematical principles 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: 42 Hours

Pre-Requisite(s): AM1101

Objectives and Content:

The instructor is required to use trade specific examples to reinforce the course objectives.

1. Describe percent/decimal/fraction conversions and comparisons in trade specific situations.
2. Describe ratios and proportions as they relate to trade specific problems.
3. Describe the use of the Imperial and Metric measurement systems in trade specific applications.
4. Describe Imperial and Metric conversions in trade specific situations.
 - i. convert between imperial and metric measurements
 - ii. convert to another unit within the same measurement system
5. Describe how to manipulate formulas using cross multiplication, dividing throughout, elimination, and substitution to solve trade specific problems.
 - i. right angle triangles
 - ii. area
 - iii. volume
 - iv. perimeter
 - v. density

6. Identify calculations involving geometry that are relevant to the trade.
 - i. angle calculations
 - ii. circle calculations

7. Identify math processes used to complete administrative trade tasks.
 - i. material estimation
 - ii. material costing
 - iii. time & labour estimates
 - iv. taxes & surcharges
 - v. markup & projecting revenue

Practical Requirements:

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

Note: This course is **Non-Transferable** to other trades programs, and **Not Eligible for Prior Learning Assessment**. Students completing training in this trade program are required to complete this math course. Apprentice transfers under Provincial / Territorial Mobility agreements may be exempt from this requirement.

CM2161 Communication Essentials

Learning Outcomes:

- Demonstrate knowledge of the importance of well-developed writing and oral communication skills in the workplace.
- Demonstrate knowledge of the principles of effective workplace writing.
- Demonstrate knowledge of the purpose of various types of workplace documentation and workplace meetings.
- Demonstrate knowledge of the importance of effective interpersonal skills in the workplace.
- Demonstrate knowledge of effective job search techniques

Duration: 36 Hours

Pre-Requisite(s): None

Objectives and Content:

Wherever possible, the instructor is expected to use trade specific examples to reinforce the course objectives.

1. Define communications terminology used in the trade.
2. Identify the principles of effective workplace writing.
 - i. grammar, punctuation, mechanics
 - ii. sentence and paragraph construction
 - iii. tone, language, and word choice
 - iv. the writing process
 - planning
 - writing
 - editing/revising
3. Identify sources of information used to communicate in the workplace.
 - i. regulations
 - ii. codes
 - iii. OH&S requirements
 - iv. prints, drawings and specifications
 - v. company and client documentation

4. Identify types and purposes of informal workplace documents.
 - i. reports
 - incident
 - process
 - progress
 - ii. common trade specific forms
 - iii. primary and secondary methods of information gathering
 - iv. accuracy and completeness in reports and forms

5. Demonstrate an understanding of interpersonal communications in the workplace.
 - i. recognize group dynamics
 - ii. contribute information and expertise
 - iii. individual learning styles
 - audible
 - visual
 - experiential
 - theoretical
 - iv. recognize respectful and open communication
 - v. accept and provide feedback
 - vi. interpret non-verbal communication cues
 - body language
 - signals

6. Demonstrate an understanding of effective oral communication skills.
 - i. listening
 - receiving, understanding, remembering, reflecting, evaluating, paraphrasing, and responding
 - ii. speaking
 - using clear and proper words
 - tone, style, and vocabulary
 - brevity
 - iii. common workplace oral communication situations
 - introducing self and others
 - telephone conversations
 - tool box/safety talks
 - face-to-face conversations
 - communicating with co-workers, supervisors, clients, and other trades people

7. Identify common practices related to workplace meetings.
 - i. meeting formats
 - ii. meeting preparation
 - iii. agendas and minutes
 - iv. roles, responsibilities, and etiquette of meeting participants

8. Identify acceptable workplace use of communication technologies.
 - i. cell / smart phone etiquette
 - ii. voice mail
 - iii. e-mail
 - iv. texting / messaging through social media
 - v. teleconferencing / videoconferencing for meetings and interviews
 - vi. social networking
 - vii. other emerging technologies

9. Demonstrate an understanding of effective job search techniques.
 - i. employment trends, opportunities, and sources of employment
 - ii. job ads and the importance of fitting qualifications to job requirements
 - iii. resumes
 - characteristics of effective resumes
 - types of resumes
 - principles of resume formatting
 - iv. effective cover letters
 - v. job interview process
 - pre-interview preparation
 - interview conduct
 - post-interview follow up

Practical Requirements:

1. Write a well-developed, coherent, unified paragraph.
2. Complete a trade-related form.
3. Prepare an agenda for a toolbox safety talk.
4. Participate in a simulated oral workplace communication situation.
5. Prepare a resume.

SD1761 Workplace Essentials

Note: It is recommended that SD1761 be delivered in the second half of Pre-employment training.

Learning Outcomes:

- Demonstrate knowledge of workplace requirements in the areas of personal responsibility, unions, workers compensation, workers' rights, and human rights.
- Demonstrate knowledge of quality customer service.

Duration: 24 Hours

Pre-Requisite(s): None

Objectives and Content:

Wherever possible, the instructor is expected to use trade specific examples to reinforce the course objectives.

1. Identify personal responsibilities and attitudes that contribute to on-the-job success.
 - i. asking questions
 - ii. working safely
 - iii. accepting constructive feedback
 - iv. time management & punctuality
 - v. respect for authority
 - vi. stewardship of materials, tools and properties
2. Define unions and identify their role in the workplace.
 - i. purpose of unions
 - ii. common union structure
 - iii. unions in this trade
3. Demonstrate an understanding of the Worker's Compensation process.
 - i. aims, objectives, and benefits of the Workplace Health, Safety and Compensation Commission
 - ii. role of the workers advisor
 - iii. internal review process

4. Demonstrate an understanding of worker's rights.
 - i. labour standards
 - ii. regulations, including:
 - hours of work & overtime
 - termination of employment
 - minimum wages & allowable deductions
 - statutory holidays, vacation time, and vacation pay

5. Demonstrate an understanding of human rights issues.
 - i. awareness of the Human Rights Code and the role of the Human Rights Commission
 - ii. categories of discrimination and strategies for prevention
 - direct
 - systemic
 - adverse effect
 - iii. types of discrimination
 - race
 - ethnic origin
 - colour
 - religion
 - age
 - gender identify
 - sexual orientation
 - marital status
 - family status
 - disability
 - criminal conviction that has been pardoned
 - iv. conduct that constitutes harassment and discrimination
 - objectionable conduct
 - comments or displays made either on a one-time or continuous basis that demeans, belittles, or causes personal humiliation or embarrassment to the recipient
 - v. the value of diversity in the workplace
 - culture
 - gender identify
 - sexual orientation

6. Demonstrate an understanding of quality customer service.
 - i. importance of quality service
 - ii. barriers to quality service
 - physical and physiological
 - cultural
 - technological

- iii. customer needs & common methods for meeting them
- iv. characteristics & importance of a positive attitude
- v. interactions with challenging customers
- vi. addressing complaints and resolve conflict

Practical Requirements:

None.

MC1062 Computer Essentials

Learning Outcomes:

- Demonstrate knowledge of desktop/laptop and mobile computers and their operation.
- Demonstrate knowledge of word processing and spreadsheet software, internet browsers and their applications.
- Demonstrate knowledge of e-mail applications and procedures.
- Demonstrate an awareness of security issues related to computers.
- Demonstrate an awareness of online learning using computers.

Duration: 15 Hours

Pre-Requisite(s): None

Objectives and Content:

When possible, the instructor is expected to use trade specific examples to reinforce the course objectives.

1. Identify computer types used in the workplace, and the characteristics of each.
 - i. desktop/laptop computers
 - ii. tablets
 - iii. smartphones
2. Identify common desktop and mobile operating systems.
 - i. Windows
 - ii. Mac OS
 - iii. iOS
 - iv. Android
3. Describe the use of Windows operating system software.
 - i. start and end a program
 - ii. use the help function
 - iii. use the find function
 - iv. maximize and minimize a window
 - v. open and scroll through multiple windows
 - vi. use the task bar
 - adjust desktop settings such as screen savers, screen resolution, and backgrounds
 - vii. shut down a computer

4. Identify the skills necessary to perform file management commands.
 - i. create folders
 - ii. copy files and folders
 - iii. move files and folders
 - iv. rename files and folders
 - v. delete files and folders

5. Describe the use of word processing software to create documents.
 - i. enter & edit text
 - ii. indent and tab text
 - iii. change text attributes
 - bold
 - underline
 - font
 - iv. change layout format
 - margins
 - alignment
 - line spacing
 - v. spell check and proofread
 - vi. save, close & reopen a document
 - vii. print document

6. Describe the use of spreadsheet software to create documents.
 - i. enter data in cells
 - ii. format data in cells
 - iii. create formulas to add, subtract, multiply and divide
 - iv. save, close & reopen a spreadsheet
 - v. print spreadsheet

7. Describe the use of the internet in the workplace.
 - i. web browsers
 - ii. search engines
 - iii. security issues
 - iv. personal responsibility for internet use at work

8. Describe the role of e-mail.
 - i. e-mail etiquette
 - grammar and punctuation
 - privacy issues when sharing and forwarding e-mail
 - work appropriate content
 - awareness of employer policies

- ii. managing e-mail
 - using folders
 - deleting, forwarding, replying
 - iii. adding attachments to e-mail
 - iv. view e-mail attachments
 - v. printing e-mail
9. Describe computer use for online learning.
- i. online training
 - ii. level exams
 - iii. study guides
 - iv. practice exams

Practical Requirements:

1. Create, save and print a document using word processing software.
2. Create, save and print a document using spreadsheet software.
3. Send and receive an e-mail with an attachment.

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

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 a certain Plan of Training. All references to Memorandum of Understanding will also apply to Letter of Understanding (LOU) agreements.

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 a 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 along with a Memorandum of Understanding as applicable to be indentured into an Apprenticeship. The Memorandum of Understanding must contain signatures of an authorized employer representative, the apprentice and an official representing the Provincial Apprenticeship and Certification Board to be valid.

2.5 A new Memorandum of Understanding must be completed for each change in an employer during the apprenticeship term.

3.0 Probationary Period

The probationary period for each Memorandum of Understanding will be six months or 900 employment credit hours. 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, such as that stated in Section 14.

5.0 Apprenticeship Progression Schedule, Wage Rates and Advanced Training Criteria

Progression Schedule

Residential Electrician - 4800 Hours			
Apprenticeship Level And Wages			
Level	Wage Rate	Requirements for Progression to Next Level	Next Level
1	60%	<ul style="list-style-type: none"> ▪ Completion of Pre-Employment / Level 1 training ▪ Registration as an apprentice ▪ Pass Level 1 exam* ▪ Minimum 1800 hours of combined relevant work experience and training 	2 nd Year
2	75%	<ul style="list-style-type: none"> ▪ Minimum 3200 hours of combined relevant work experience and training 	3 rd Year
3	90%	<ul style="list-style-type: none"> ▪ Minimum 4800 hours of combined relevant work experience and training ▪ Sign-off of all workplace skills in apprentice logbook ▪ Pass certification exam 	Journeyman Certification

Wage Rates

- 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.

Level Exams*

- This program may **not** currently contain level exams, in which case this requirement will be waived until such time as level exams are available.

Residential Electrician - 4800 Hours		
Class Calls (After Apprenticeship Registration)		
Call Level	Requirements for Class Call	Hours awarded for In-School Training
Direct Entry Level 1	<ul style="list-style-type: none"> ▪ Minimum of 1800 hours of relevant work experience ▪ Prior Learning Assessment (PLA) at designated college (if applicable) ▪ Completion of Pre-Employment / AACS Level 1 Construction / Industrial Electrician (if applicable) 	To be determined by the number of courses completed after each class call
<p>Direct 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.

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 Immigration, Population Growth and Skills within 30 days of the decision.

C. Requirements for Provincial Certification

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 the program.
3. A combination of training from an approved training program and suitable work experience totaling 4800 hours.

Or

A total of 7200 hours of suitable work experience.

4. Completion of a Provincial certification 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.
- ensures a certified journeyman is currently on staff in the same trade area as the apprentice and whose certification is recognized by the NL Department of Immigration, Skills and Labour.

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 level, provincial and 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.