

Construction Electrician Guide to Course Content

2021



Online: www.saskapprenticeship.ca

Recognition:

To promote transparency and consistency, this document has been adapted from the 2015 Construction Electrician Red Seal Occupational Standard (Employment and Social Development Canada).

A complete version of the Occupational Standard can be found at www.red-seal.ca

STRUCTURE OF THE GUIDE TO COURSE CONTENT

To facilitate understanding of the occupation, this guide to course content contains the following sections:

Description of the Construction Electrician trade: an overview of the trade's duties and training requirements.

Essential Skills Summary: an overview of how each of the nine essential skills is applied in this trade.

Elements of harmonization of apprenticeship training: includes adoption of Red Seal trade name, number of levels of apprenticeship, total training hours (on-the-job and in-school) and consistent sequencing of technical training content. Implementation for harmonization will take place progressively. Level one to be implemented in 2017/2018, level two 2018/2019, level three 2019/2020, and level four in 2020/2021.

Task Matrix: a chart which outlines graphically the major work activities, tasks and sub-tasks of this standard detailing the essential skills and the level of training where the content is covered.

Major Work Activity (MWA): the largest division within the standard that is comprised of a distinct set of trade activities.

Task: distinct actions that describe the activities within a major work activity.

Sub-task: distinct actions that describe the activities within a task.

Training Profile Chart: a chart which outlines the model for Saskatchewan Apprenticeship and Trade Certification Commission (SATCC) technical training sequencing with a cross reference to the Harmonized apprenticeship technical training sequencing, at the topic level.

Technical Training Course Content for the Construction Electrician trade: a chart which outlines the model for SATCC technical training sequencing. For the harmonized level of training, a cross reference to the Harmonized apprenticeship technical training sequencing, at the learning outcome level, is provided.

Appendix A: Post Harmonization Training Profile Chart: a chart which outlines the finalized model for SATCC technical training sequencing with a cross reference to the Harmonized apprenticeship technical training sequencing, at the topic level.

The Red Seal Construction Electrician Curriculum Outline, which provides additional detail of the Harmonized technical training, can be found at www.red-seal.ca

DESCRIPTION OF THE CONSTRUCTION ELECTRICIAN TRADE

Construction electricians install, repair, test and maintain wiring, controls, motors and other electrical devices in a variety of locations and includes all “work of electrical installation.”

Construction electricians plan, design, assemble, install, alter, repair, inspect, verify, commission, connect, operate, maintain and decommission electrical systems. Electrical systems provide heating, lighting, power, alarm, security, communication and control in residential, commercial, institutional, industrial, transportation and entertainment environments. Construction electricians may be self-employed or employed by electrical contractors, utilities, and operations and maintenance departments of various facilities and municipalities.

Construction electricians must read and interpret electrical, mechanical, civil and architectural drawings and specifications such as electrical, building, fire, and jurisdictional codes to complete electrical installations. They use electrical test equipment and digital technology to ensure system safety, functionality and compatibility.

Construction electricians require good communication skills to negotiate, coordinate and facilitate work with clients, co-workers, jurisdictional authorities and other trades. Organizational skills are required to successfully plan and execute their work. They also require strong analytical and problem-solving skills in order to read and interpret diagrams, drawings and specifications. They require mechanical aptitude to install, diagnose and repair systems and components. It is beneficial for construction electricians to have good vision, the ability to distinguish colours, manual dexterity and a willingness to keep up with new developments in the trade. With changing technologies, digital and computer skills are necessary to this trade for job performance, learning methods and updating skills.

Their work may be performed indoors or outdoors, at heights, in confined spaces and in hazardous environments. They require stamina as construction electricians spend much of their time performing static and physical tasks such as climbing. Occupational risks include shocks, industrial diseases, arc flashes, falls and injury from repetitive motion, lifting and kneeling.

Construction electricians play a crucial role as mentors and trainers to apprentices in the trade. They may also advance to positions such as foremen, instructors, project managers, superintendents, estimators, technicians, system designers, electrical inspectors or start their own contracting business. Construction electricians may enhance their skills in different fields such as restorative, service or retrofit work rather than new construction.

Training Requirements: To graduate from each level of the apprenticeship program, an apprentice must successfully complete the required technical training and compile enough on-the-job experience to total at least 1800 hours each year. Total trade time required is 7200 hours and at least 4 years in the trade.

There are four levels of technical training delivered by Saskatchewan Polytechnic in Moose Jaw, Regina, and Saskatoon.

Level One: 8 weeks

Level Two: 8 weeks

Level Three: 8 weeks

Level Four: 8 weeks

***Any person who is not a journeyperson construction electrician must become registered as an apprentice to work in this trade.**

The information contained in this guide to course content details the technical training delivered for each level of apprenticeship. An apprentice spends approximately 15% of their apprenticeship term in a technical training institute learning the technical and theoretical aspects of the trade. The hours and percentages of technical and practical training may vary according to class needs and progress.

The content of the technical training components is subject to change without notice.

Entrance Requirements for Apprenticeship Training

Your grade twelve transcripts (with no modified classes) or GED 12 is your guarantee that you meet the educational entrance requirements for apprenticeship in Saskatchewan. In fact, employers prefer and recommend apprentices who have completed high school. This ensures the individual has all of the necessary skills required to successfully complete the apprenticeship program, and receive journeyperson certification.

Individuals with “modified” or “general” classes in math or science do not meet our entry requirements. These individuals are required to take an entrance assessment prescribed by the SATCC.

English is the language of instruction in all apprenticeship programs and is the common language for business in Saskatchewan. Before admission, all apprentices and/or “upgraders” must be able to understand and communicate in the English language. Applicants whose first language is not English must have a minimum Canadian Language Benchmark Assessment of six (CLB6).

Note: A CLB assessment is valid for a one-year period from date of issue.

Designated Trade Name	Math Credit at the Indicated Grade Level ^❶	Science Credit at Grade Level
Construction Electrician	Grade 11	Grade 10
<p>^❶ - (One of the following) WA – Workplace and Apprenticeship; or F – Foundations; or P – Pre-calculus, or a Math at the indicated grade level (Modified and General Math credits are not acceptable.).</p> <p>*Applicants who have graduated in advance of 2015-2016, or who do not have access to the revised Science curricula will require a Science at the minimum grade level indicated by trade.</p> <p>For information about high school curriculum, including Math and Science course names, please see: http://www.curriculum.gov.sk.ca/#</p> <p>Individuals not meeting the entrance requirements will be subject to an assessment and any required training</p>		

ESSENTIAL SKILLS SUMMARY

Essential skills are needed for work, learning and life. They provide the foundation for learning all other skills and enable people to evolve with their jobs and adapt to workplace change.

Through extensive research, the Government of Canada and other national and international agencies have identified and validated nine essential skills. These skills are used in nearly every occupation and throughout daily life in different ways.

A series of CCDA-endorsed tools have been developed to support apprentices in their training and to be better prepared for a career in the trades. The tools can be used independently or with the assistance of a tradesperson, trainer, employer, teacher or mentor to:

- understand how essential skills are used in the trades;
- learn about individual essential skills strengths and areas for improvement; and
- improve essential skills and increase success in an apprenticeship program.

The tools are available online or for order at: www.esdc.gc.ca/eng/jobs/les/profiles/index.shtml

The application of these skills may be described throughout this document within the skills and knowledge which support each sub-task of the trade. The most important essential skills for each sub-task have also been identified. The following are summaries of the requirements in each of the essential skills, taken from the essential skills profile. A link to the complete essential skills profile can be found at www.red-seal.ca.

READING

Construction electricians read several types of documents such as purchase order agreements and instructions for installing systems and components. They also need to read and understand the Canadian Electrical Code (CEC), which contains legal and highly technical language. They also read other tradespersons' plans and specifications to understand the sequences of installation and locations of apparatus.

DOCUMENT USE

Construction electricians apply document use skills when they read, interpret and collate information from several documents such as plans, specifications, diagrams and schematics. They reference and interpret these documents when installing, assembling, diagnosing and repairing electrical components and systems. The translation of two-dimensional and three-dimensional drawings into three-dimensional applications also requires strong document use skills.

WRITING

Writing skills are required for construction electricians to record information about their daily work, including hours worked, job locations and details of conversations about the job. They may also be required to record details on an incident or an accident report. They also make notations on as-built drawings to indicate changes from the original drawings, accurately describing the current installation. Labelling and identifying electrical systems also require this skill.

ORAL COMMUNICATION

Strong oral communication skills are needed for construction electricians as they often need to relay messages, give directions, coordinate tasks with co-workers and discuss electrical code requirements with safety or building inspectors. They also regularly interact with supervisors, engineers, owners, architects, inspectors and other tradespersons to solve technical problems, to discuss work progress, and to ensure that work can meet scheduling and code requirements. They also exchange opinions with co-workers regarding critical safety issues related to complex installations.

NUMERACY

Construction electricians use their numeracy skills to size and place electrical systems and components, ensuring that installations meet electrical code requirements. They take measurements and perform complex calculations using principles of mathematics such as geometry and trigonometry. Construction electricians also use numeracy skills to design or modify electrical installations.

THINKING SKILLS

Construction electricians use thinking skills when they plan their work in order to ensure efficient use of time and resources. These skills also entail resolving issues such as system routing, and equipment placement and interconnection taking into account client specifications and code requirements. Additionally, these skills are called upon when consulting with other experienced tradespersons, manufacturers' representatives or engineers to solve technical problems.

WORKING WITH OTHERS

Construction electricians often work with co-workers, other trades, supervisors, owner representatives, architects, engineers, inspectors and suppliers. They may be required to demonstrate how to perform a task to other workers, mentor and orient or train new employees. They also participate in discussions about work processes or product improvement.

DIGITAL TECHNOLOGY

Construction electricians use different types of hand-held digital devices such as oscilloscopes, multimeters and Power Quality Analyzers (PQA) to aid in diagnosing system and component failure. They also use different types of software to interface with these devices. They use their computer skills to improve the efficiency of product research, communication, record keeping, job tracking and information exchange with co-workers, other trades, supervisors, owner representatives, architects, engineers, inspectors and suppliers.

CONTINUOUS LEARNING

It is important for construction electricians to stay up-to-date with changing requirements of the electrical code or with changes in technology, such as computer controls. They must be adaptable to change to advance their skills and increase their knowledge. These learning skills are applied when attending classes offered through unions, employers and other groups.

ELEMENTS OF HARMONIZATION FOR APPRENTICESHIP TRAINING

At the request of industry, the Harmonization Initiative was launched in 2013 to *substantively align* apprenticeship systems across Canada by making training requirements more consistent in the Red Seal trades. Harmonization aims to improve the mobility of apprentices, support an increase in their completion rates and enable employers to access a larger pool of apprentices.

As part of this work, the Canadian Council of the Directors of Apprenticeship (CCDA) identified four main harmonization priorities in consultation with industry and training stakeholders:

1. Trade name

The official Red Seal name for this trade is Construction Electrician.

2. Number of Levels of Apprenticeship

The number of levels of technical training recommended for the Construction Electrician trade is four.

3. Total Training Hours during Apprenticeship Training

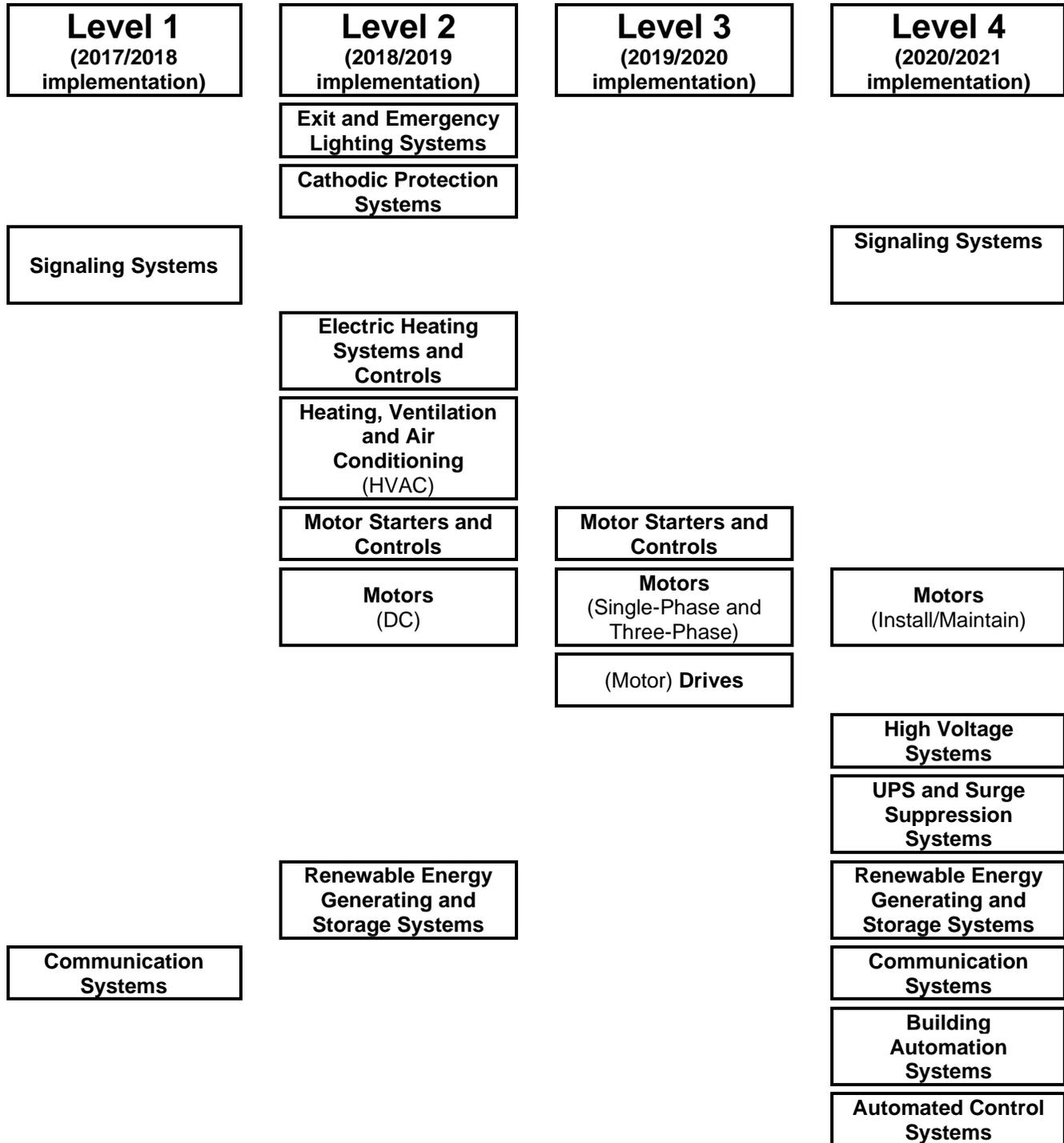
The total hours of training, including both on-the-job and in-school training for the Construction Electrician trade is 7200.

4. Consistent sequencing of training content (at each level) using the most recent Occupational Standard

Harmonization for the Construction Electrician trade has been fully implemented for each technical training level. See the “Technical Training Course Content” section of this guide for further details.

White boxes are “Topics,” grey boxes are “In Context”. In context means learning that has already taken place and is being applied to the applicable task. Learning outcomes for in context topics are accomplished in other topics in that level.

Level 1 (2017/2018 implementation)	Level 2 (2018/2019 implementation)	Level 3 (2019/2020 implementation)	Level 4 (2020/2021 implementation)
Organizes Work	Organizes Work	Organizes Work	Organizes Work
Protection Devices	Protection Devices	Protection Devices	Protection Devices
Plans, Drawings and Specifications	Plans, Drawings and Specifications	Plans, Drawings and Specifications	Plans, Drawings and Specifications
Electronics (no task in RSOS)	Electronics (no task in RSOS)	Electronics (no task in RSOS)	Electronics (no task in RSOS)
Canadian Electrical Code	Canadian Electrical Code	Canadian Electrical Code	Canadian Electrical Code
Support Components	Support Components	Support Components	Support Components
Raceways, Cables, Conductors and Enclosures	Raceways, Cables, Conductors and Enclosures	Raceways, Cables, Conductors and Enclosures	Raceways, Cables, Conductors and Enclosures
Commissions and Decommissions Systems	Commissions and Decommissions Systems	Commissions and Decommissions Systems	Commissions and Decommissions Systems
Safety			
Tools and Equipment			
Communication and Mentoring Techniques			Communication and Mentoring Techniques
Grounding, Bonding	Grounding, Bonding (Single-Phase)	Grounding, Bonding (Three-Phase)	Grounding, Bonding, Ground Fault Detection Systems
Branch Circuitry and Devices (AC/DC Introduction)	Branch Circuitry and Devices (Single-Phase AC)	Branch Circuitry and Devices (Three-Phase AC)	Branch Circuitry and Devices (Specialty)
Consumer/Supply Services and Metering Equipment (Single-Phase)		Consumer/Supply Services and Metering Equipment (Three-Phase)	
Distribution Equipment (Single-Phase)		Distribution Equipment (Three-Phase)	
	Power Generating Systems (DC)	Power Generating Systems (AC)	
	Transformers (Single-Phase)	Transformers (Three-Phase)	



CONSTRUCTION ELECTRICIAN

TASK MATRIX CHART

This chart outlines the major work activities, tasks and sub-tasks from the 2015 Construction Electrician Red Seal Occupational Standard. Each sub-task details the corresponding essential skill and level of training where the content is covered.*

*Sub-tasks with numbers in the boxes is where the content will be delivered in training. Harmonization for the Construction Electrician trade has been fully implemented for each technical training level.

A - PERFORMS COMMON OCCUPATIONAL SKILLS

A-1 Performs safety-related functions.	1.01 Uses personal protective equipment (PPE) and safety equipment. 1	1.02 Maintains safe work environment. 1	1.03 Performs lock-out and tag-out procedures. 1		
A-2 Uses tools and equipment.	2.01 Uses common and specialty tools and equipment. 1	2.02 Uses access equipment. 1	2.03 Uses rigging, hoisting and lifting equipment. 1		
A-3 Organizes work.	3.01 Interprets plans, drawings and specifications. 1,2,3,4	3.02 Organizes materials and supplies. 1,2,3,4	3.03 Plans project tasks and procedures. 1,2,3,4	3.04 Prepares worksite. 1,2,3,4	3.05 Finalizes required documentation. 1,2,3,4
A-4 Fabricates and installs support components.	4.01 Fabricates support structures. 1	4.02 Installs brackets, hangers and fasteners. 1	4.03 Installs seismic restraint systems. 1		
A-5 Commissions and decommissions electrical systems.	5.01. Performs startup and shutdown procedures. 1,2,3,4	5.02 Performs commissioning and decommissioning of systems. 1,2,3,4			

A-6 Uses communication and mentoring techniques.

6.01 Uses communication techniques.

1

6.02 Uses mentoring techniques.

4

B – INSTALLS, SERVICES AND MAINTAINS GENERATING, DISTRIBUTION AND SERVICE SYSTEMS

B-7 Installs, services and maintains consumer/ supply services and metering equipment.

7.01 Installs single-phase consumer/ supply services and metering equipment.

1

7.02 Installs three-phase consumer/ supply services and metering equipment.

4

7.03 Performs servicing and maintenance of single-phase services and metering equipment.

1

7.04 Performs servicing and maintenance of three-phase services and metering equipment.

4

B-8 Installs, services and maintains protection devices.

8.01 Installs overcurrent protection devices.

1,2,3,4

8.02 Installs ground fault, arc fault and surge protection devices.

1,2,3,4

8.03 Performs servicing and maintenance of protection devices.

1,2,3,4

B-9 Installs, services and maintains distribution equipment.

9.01 Installs power distribution equipment.

1,4

9.02 Performs servicing and maintenance of power distribution equipment.

1,4

B-10 Installs, services and maintains power conditioning, uninterruptible power supply (UPS) and surge suppression systems.

10.01 Installs power conditioning, UPS and surge suppression systems.

4

10.02 Performs servicing and maintenance of power conditioning, UPS and surge suppression systems.

4

B-11 Installs, services and maintains bonding and grounding protection systems.	11.01 Installs grounding and bonding systems. 1,2,3,4	11.02 Installs ground fault systems. 1,2,3,4	11.03 Installs lightning protection systems. 1,2,3,4	11.04 Performs servicing and maintenance of bonding and grounding systems. 1,4	
B-12 Installs, services and maintains power generation systems.	12.01 Installs AC (alternating current) generating systems. 3	12.02 Performs servicing and maintenance of AC generating systems. 3	B-12.03 Installs DC (direct current) generating systems. (NOT COMMON CORE) 2	12.04 Performs servicing and maintenance of DC generating systems. (NOT COMMON CORE) 2	
B-13 Installs, services and maintains renewable energy systems.	13.01 Installs renewable energy systems. 4	13.02 Performs servicing and maintenance of renewable energy systems. 4			
B-14 Installs, services and maintains high voltage systems.	14.01 Installs high voltage equipment. 4	14.02 Installs high voltage cables. 4	14.03 Performs servicing and maintenance of high voltage systems. 4		
B-15 Installs, services and maintains transformers.	15.01 Installs extra-low voltage transformers. 2	15.02 Installs low-voltage single-phase transformers. 2	15.03 Installs low-voltage three-phase transformers. 3	15.04 Installs high voltage transformers. 3	15.05 Performs servicing and maintenance of transformers. 3

C – INSTALLS, SERVICES AND MAINTAINS WIRING SYSTEMS

C-16 Installs, services and maintains raceways, cables and enclosures.	16.01 Installs conductors and cables. 1,2	16.02 Installs conduit, tubing and fittings. 1,2	16.03 Installs raceways. 1,2	16.04 Installs boxes and enclosures. 1,2	16.05 Performs servicing and maintenance of raceways, cables and enclosures. 1,2
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C-17 Installs, services and maintains branch circuitry.	C-17.01 Installs luminaires. 1,2,3	17.02 Installs wiring devices. 1,2,3	17.03 Installs lighting controls. 1,2,3	17.04 Installs lighting standards. 1,2,3	17.05 Performs servicing of branch circuitry. 1,2,3
	17.06 Installs, services and maintains airport runway lighting systems. 4	17.07 Installs, services and maintains traffic signal lights and controls. 4			
C-18 Installs, services and maintains heating, ventilating and air-conditioning (HVAC) systems.	18.01 Connects HVAC systems. 2	18.02 Installs HVAC controls. 2	18.03 Performs servicing and maintenance of HVAC systems and controls. 2		
C-19 Installs, services and maintains electric heating systems.	19.01 Installs electric heating systems. 2	19.02 Installs electric heating system controls. 2	19.03 Performs servicing and maintenance of electric heating systems and controls. 2		
C-20 Installs, services and maintains exit and emergency lighting systems.	20.01 Installs exit and emergency lighting. 2	20.02 Performs servicing and maintenance of exit and emergency lighting systems. 2			
C-21 Installs, services and maintains cathodic protection systems.	21.01 Installs cathodic protection systems. 2	21.02 Performs servicing and maintenance of cathodic protection systems. 2			

D – INSTALLS, SERVICES AND MAINTAINS MOTORS AND CONTROL SYSTEMS

<p>D-22 Installs, services and maintains motor starters and controls.</p>	<p>22.01 Installs motor starters.</p> <p>2,3</p>	<p>22.02 Performs servicing and maintenance of motor starters.</p> <p>2,3</p>	<p>D-22.03 Installs motor controls.</p> <p>2,3</p>	<p>22.04 Performs servicing and maintenance of motor controls.</p> <p>2,3</p>	
<p>D-23 Installs, services and maintains drives.</p>	<p>23.01 Installs AC drives.</p> <p>3</p>	<p>23.02 Performs servicing and maintenance of AC drives.</p> <p>3</p>	<p>23.03 Installs DC drives.</p> <p>3</p>	<p>23.04 Performs servicing and maintenance of DC drives.</p> <p>3</p>	
<p>D-24 Installs, services and maintains motors.</p>	<p>24.01 Installs single-phase motors.</p> <p>3,4</p>	<p>24.02 Performs servicing and maintenance of single-phase motors.</p> <p>3,4</p>	<p>24.03 Installs three-phase motors.</p> <p>3,4</p>	<p>24.04 Performs servicing and maintenance of three-phase motors.</p> <p>3,4</p>	<p>24.05 Installs DC motors.</p> <p>2,3,4</p>
	<p>24.06 Performs servicing and maintenance of DC motors.</p> <p>2,3,4</p>				
<p>D-25 Installs, programs, services and maintains automated control systems.</p>	<p>25.01 Installs automated control systems.</p> <p>4</p>	<p>25.02 Performs servicing and maintenance of automated control systems.</p> <p>4</p>	<p>25.03 Programs and configures automated control systems.</p> <p>4</p>		

E – INSTALLS, SERVICES AND MAINTAINS SIGNALLING AND COMMUNICATION SYSTEMS

<p>E-26 Installs, services and maintains signaling systems.</p>	<p>26.01 Installs fire alarm systems.</p> <p>4</p>	<p>26.02 Performs servicing and maintenance of fire alarm systems.</p> <p>4</p>	<p>26.03 Installs security and surveillance systems.</p> <p>1,4</p>	<p>26.04 Performs servicing and maintenance of security and surveillance systems.</p> <p>1,4</p>
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<p>E-27 Installs, services and maintains communication systems.</p>	<p>27.01 Installs voice/data/video (VDV) and community antenna television (CATV) systems.</p> <p>1,4</p>	<p>27.02 Installs public address (PA) and intercom systems.</p> <p>1,4</p>	<p>27.03 Installs nurse call systems.</p> <p>1,4</p>	<p>27.04 Performs servicing and maintenance of communication systems.</p> <p>1,4</p>
<p>E-28 Installs, services and maintains integrated control systems.</p>	<p>28.01 Installs building automation systems.</p> <p>4</p>	<p>28.02 Installs building control systems.</p> <p>4</p>	<p>28.03 Performs servicing and maintenance of integrated control systems.</p> <p>4</p>	

TRAINING PROFILE CHART

This Training Profile Chart represents Saskatchewan Apprenticeship and Trade Certification Commission (SATCC) technical training at the topic level.

Level One	Transcript Code	Hours
Safety and Personal Protective Equipment	SFTY 131	20
Introductory Electrical Theory and Practices	BT 131	48
Extra-Low Voltage, Magnetism and Meters	BWC 131	36
Wiring Methods	WM 130	34
Single Dwelling Plans, Lighting and Services	PLS 130	34
Solving DC Circuits	BT 130	36
Conductors and Branch Circuits	BWC 130	30
		240

Level Two	Transcript Code	Hours
DC Machines	EMC 225	30
Motor Starters and Controls	EMC 227	18
Electronic Instruments, Rectification, and Filtering	IE 222	36
Services Under 900 Square Meters	PLS 222	42
Transformers	TRNS 220	36
Residential Electric Heat	HC 220	6
Heating and Cooling Systems	HC 221	30
AC Theory and Meters	BT 220	24
Resistive, Inductive, and Capacitive Circuits	BT 224	18
		240

Level Three	Transcript Code	Hours
Motor Starters and Controls	EMC 325	42
Three-Phase Rectification and DC Power Supplies	IE 322	36
Sensors and Phase Control and Data Cabling	IE 323	36
Services for Occupancies Over 900 Square Metres	PLS 323	36
AC Motors	EMC 326	24
Three-Phase Theory/Alternators	BT 325	33
Three-Phase Transformers	TRNS 322	33
		240

Level Four	Transcript Code	Hours
Hazardous Locations	WM 420	18
Power Factor Correction	BT 426	24
Three-Phase Four-Wire Services and Code Review	PLS 424	42
Thyristors	IE 425	24
Programmable Logic Controllers	IE 427	36
Primary Metering and High Voltage	HVM 424	30
Building Systems	BLDG 400	36
Fire Alarm Systems	FA 420	30
		240

TECHNICAL TRAINING COURSE CONTENT

This chart outlines the model for Saskatchewan Apprenticeship and Trade Certification Commission (SATCC) technical training sequencing. For the harmonized levels of training, a cross reference to the Red Seal Occupational Standard (RSOS) apprenticeship technical training sequencing, at the learning outcome level, is provided.

Harmonization for the Construction Electrician trade has been fully implemented for each technical training level. See the “Technical Training Course Content” section below for further details.

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Level One	8 weeks	240 hours
Safety and Personal Protective Equipment		20 hours
<ul style="list-style-type: none">• describe <i>The Saskatchewan Employment Act</i> and <i>The Occupational Health and Safety Regulations</i> requirements in the electrical trade• describe personal protective equipment• describe arc flash• describe rigging equipment• describe applicable health and safety regulation and legislation in rigging applications• describe safe hoisting operations• describe safe hoisting or pulling operations without a crane		
RSOS topics covered in this section of training:		
A-1 Performs safety-related functions		
A-1.01 Uses personal protective equipment (PPE) and safety equipment		
<ul style="list-style-type: none">• PPE and safety equipment, their applications, maintenance, storage, and procedures for use• regulatory requirements pertaining to PPE and safety equipment		
A-1.02 Maintains safe work environment		
<ul style="list-style-type: none">• safe work practices• regulatory requirements pertaining to hazards and emergency situations		
A-1.03 Performs lock-out and tag-out procedures		
<ul style="list-style-type: none">• lock-out and tag-out procedures and legislation governing minimum standards• safety checks of equipment• procedures for voltage testing		
A-2 Tools and Equipment		
A-2.01 Uses common and specialty tools and equipment		
<ul style="list-style-type: none">• tools and equipment, their applications and procedures for use• manufacturers' specifications, and operating and maintenance instructions• inspection procedures• limitations and ratings of electrical measuring equipment• certification requirements to operate powder-actuated tools		
A-2.02 Uses access equipment		
<ul style="list-style-type: none">• identify traffic areas and potential hazards• install barricades and signage to contain work zone• select access equipment• set up and secure step ladders and extension ladders• visually and mechanically inspect for worn, damaged and defective access equipment		

- report, tag and decommission unsafe, worn, damaged and defective access equipment
 - organize and store access equipment
 - work from approved and certified access equipment
- A-2.03 Uses rigging, hoisting and lifting equipment
- hoisting, lifting and rigging equipment, their applications, limitations, and procedures for use
 - regulatory requirements pertaining to hoisting, lifting and rigging equipment
 - basic hoisting and lifting operations

Introductory Electrical Theory and Practices

48 hours

- describe the electrician trade in Saskatchewan
- describe the application of the Canadian Electrical Code
- describe basic principles of electricity
- describe basic electrical circuit concepts
- describe common electrical devices
- select common fasteners
- terminate conductors
- connect basic electrical circuits

RSOS topics covered in this section of training:

A-4 Fabricates and installs support components

A-4.02 Installs brackets, hangers and fasteners

- brackets hangers and fasteners, their applications and their use
- measurement and layout techniques

A-4.03 Installs seismic restraint systems

- seismic restraint systems, their applications and their use

A-6 Uses communication and mentoring techniques

A-6.01 Uses communication techniques

- trade terminology
- effective communication processes

Extra-Low Voltage, Magnetism, and Meters

36 hours

- describe the principles of electromagnetism
- describe the operating principles of meters
- use meters for voltage measurement
- use meters for current measurement
- use meters for resistance measurement
- use meters for power and energy measurement
- install basic signal systems
- install remote control relay systems

RSOS topics covered in this section of training:

E-26 Installs, services, and maintains signaling systems

E-26.01 Installs fire alarm systems

- types of fire alarm systems, their applications and operation
- install, upgrade and connect fire alarm systems and their components

E-26.02 Performs servicing and maintenance of fire alarm systems

- fire alarm systems, their applications and operation
- service and maintain fire alarm systems

E-26.03 Installs security and surveillance systems

- security and surveillance systems, their applications and operation
- install, upgrade and connect security and surveillance systems and their components

E-26.04 Performs servicing and maintenance of security and surveillance systems

- security and surveillance systems, their applications and operation

- service and maintain security and surveillance systems

E-27 Installs, services and maintains communication systems

E-27.01 Installs voice/data/video (VDV) and community antenna television (CATV) systems

VDV and CATV systems, their applications and operation

- procedures used to install VDV and CATV systems

E-27.02 Installs public address (PA) and intercom systems

- PA and intercom systems, their applications and operation
- the procedures used to install, upgrade and connect PA and intercom systems

E-27.03 Installs nurse call systems

- nurse call systems, their applications and operation
- the procedures used to install nurse call systems

E-27.04 Performs servicing and maintenance of communication systems

- communication systems, their applications and operation
- procedures used to service and maintain communication systems

Wiring Methods

34 hours

- install non-metallic sheathed cable
- install armoured cable
- describe aluminum sheathed cable
- describe mineral insulated cable
- describe raceways
- describe rigid and flexible conduit
- describe electrical metallic tubing
- describe rigid PVC conduit
- describe surface raceways
- describe installation requirements for data cabling
- terminate data cabling

RSOS topics covered in this section of training:

C-16 Installs, services and maintains raceways, cables and enclosures

C-16.01 Installs conductors and cables

- types of conductors and cables and their associated components
- procedures used to remove and/or install conductors and cables

C-16.02 Installs conduit, tubing and fittings

- types of conduit, tubing and fittings, their components and applications
- procedures to remove and/or install conduit, tubing and fittings

C-16.03 Installs raceways

- types of raceways and their components
- procedures used to remove and/or install and support raceways

C-16.04 Installs boxes and enclosures

- boxes and enclosures
- procedures used to remove and/or install and support boxes and enclosures

C-16.05 Performs servicing and maintenance of raceways, cables and enclosures

- procedures to service raceways, cables and enclosures
- procedures to maintain raceways, cables and enclosures

Single Dwelling Plans, Lighting, and Services

36 hours

- describe common construction drawings
- describe electrical drawings, symbols and schedules
- determine lighting requirements
- determine single dwelling service requirements
- install single dwelling services

RSOS topics covered in this section of training:

A-3 Organizes Work

A-3.01 Interprets plans, drawings and specifications

- drawings, schematics, and specifications and their applications
- imperial and SI units in trade documentation
- interpretation and extraction of information from drawings, schematics, and specifications

B-7 Installs, services and maintains consumer/supply services and metering equipment

B-7.01 Installs single-phase consumer/supply services and metering equipment

- single-phase services and their applications
- single-phase service installation methods
- load calculations for a single-phase service

B-7.03 Performs servicing and maintenance of single-phase services and metering equipment

- methods used to service and maintain single-phase service
- theory of single-phase systems

B-9 Installs, services and maintains distribution equipment

B-9.01 Installs power distribution equipment

- power distribution equipment, their applications and operation
- the procedures used to install power distribution equipment

B-9.02 Performs servicing and maintenance of power distribution equipment

- the methods and theory used to service and maintain power distribution equipment

Conductors and Branch Circuits

30 hours

- describe common conductors
- calculate conductor resistance and ampacity
- select overcurrent devices
- select bonding conductors
- determine branch circuit requirements

RSOS topics covered in this section of training:

No Specific Task in RSOS

Solving DC Circuits

36 hours

- analyze series circuits
- analyze parallel circuits
- analyze combination circuits
- analyze three-wire circuits
- connect cells and batteries

RSOS topics covered in this section of training:

B-11 Installs, services, and maintains bonding and grounding protection systems

B-11.01 Installs grounding and bonding systems

- grounding and bonding methods and equipment
- procedures used to install grounding systems
- procedures used to install bonding systems

B-11.02 Installs ground fault systems

- ground fault systems and their operation
- ground fault system installation methods

B-11.03 Installs lightning protection systems

- lightning protection systems and their operation
- lightning protection system installation methods

C-17 Installs, services and maintains branch circuitry

C-17.01 Installs luminaires

- luminaires, their applications and operation
- procedures used to remove and/or install and support luminaires

C-17.02 Installs wiring devices

- wiring devices, their applications and operation
- procedures used to remove and install wiring devices

C-17.03 Installs lighting controls

- types of lighting control components, their applications and operation
- procedures used to remove and/or install, connect and test lighting control components

C-17.04 Installs lighting standards

- lighting standards and their applications
- procedures used to remove and install lighting standards

C-17.05 Performs servicing of branch circuitry

- branch circuitry and branch circuitry components procedures used to service branch circuitry and branch circuitry components

Level One topics from the RSOS that are taught in context:

A-3 Organizes Work

A-5 Commissions and Decommissions Systems

B-8 Installs, services and maintains protection devices

Canadian Electrical Code

For details regarding the In Context Topic, see page 34

Level Two

8 weeks

240 hours

DC Machines

30 hours

- describe typical DC machine construction
- describe common DC generator connections
- connect DC generators
- describe DC motor connections
- connect DC motors
- connect DC generators in parallel

RSOS topics covered in this section of training:

B-12 Installs, services, and maintains power generation systems

- B-12.03 Installs direct current (DC) generating systems
- DC generating systems and DC generating system components, their applications and operation
 - install and connect DC generating systems
- B-12.04 Performs servicing and maintenance of DC generating systems
- DC generating systems, their applications and operation
 - procedures used to service and maintain DC generating systems

D-24 Installs, services and maintains motors

- D-24.05 Installs DC motors
- DC motors, their applications and procedures for use
 - procedures used to install and connect DC motors
- D-24.06 Performs servicing and maintenance of DC motors
- DC motors, their applications and procedures for use
 - procedures used to service and maintain DC motors

Motor Starters and Controls

18 hours

- connect manual motor control circuits
- connect overload protection
- connect electromagnetic motor control circuits
- determine motor control (installation standards)

RSOS topics covered in this section of training:

D-22 Installs, services, and maintains motor starters and controls

- D-22.01 Installs motor starters
- motor starters and their application
 - install and connect motor starters
- D-22.02 Performs servicing and maintenance of motor starters
- motor starters and their application
 - procedures used to service and maintain motor starters
- D-22.03 Installs motor controls
- motor control devices and their application
 - motor control circuits and their characteristics and applications

Electronic Instruments, Rectification and Filtering

36 hours

- select resistors for electronic circuits
- use voltmeters in electronic circuits
- use AC wave forms and DC
- describe semi-conductor junction diodes
- connect single-phase 1/2 wave rectifier circuit
- connect single-phase bi-phase rectifier circuit
- connect single-phase bridge rectifier circuit
- describe resistive/capacitive (RC) time constants
- connect basic rectifier filter circuits

RSOS topics covered in this section of training:

No Specific Task in RSOS

Services Under 900 Square Meters

42 hours

- determine single phase motors (branch circuit and feeder requirements)
- determine feeder requirements (motors and other loads combined)
- determine service entrance requirements (for institutional buildings up to and including 900 sq. meters, for common institutional and commercial buildings, and for row housing and apartment building complexes)

-
- renewable energy generating and storage systems
 - cathodic protection
 - exit and emergency lighting systems

RSOS topics covered in this section of training:

B-11 Installs, services and maintains bonding and grounding protection systems

B-11.01 Installs grounding and bonding systems

- grounding and bonding methods and equipment
- procedures used to install grounding systems
- procedures used to install bonding systems

B-11.02 Installs ground fault systems

- ground fault system and their operation
- ground fault system installation methods

B-11.03 Installs lightning protection systems

- lightning protection systems and their operation
- lightning protection system installation methods

B-13 Installs, services and maintains renewable energy systems

B-13.01 Installs renewable energy systems

- renewable energy systems, their applications and operation
- procedures to install and connect renewable energy systems and control system components

B-13.01 Performs servicing and maintenance of renewable energy systems

- renewable energy systems, their applications and operation
- procedures to service and maintain renewable energy systems

C-16 Installs, services and maintains raceways, cables and enclosures

C-16.01 Installs conductors and cables

- types of conductors and cables and their associated components
- procedures used to remove and/or install conductors and cables

C-16.02 Installs conduit, tubing and fittings

- types of conduit, tubing and fittings, their components and applications
- procedures to remove and/or install conduit, tubing and fittings

C-16.03 Installs raceways

- types of raceways and their components
- procedures used to remove and/or install support raceways

C-16.04 Installs boxes and enclosures

- knowledge of boxes and enclosures
- procedures used to remove and/or install and support boxes and enclosures

C-16.05 Performs servicing and maintenance of raceways, cables, and enclosures

- procedures and service raceways, cables and enclosures
- procedures to maintain raceways, cables and enclosures

C-17 Installs, services and maintains branch circuitry

C-17.01 Installs luminaires

- luminaires, their applications and operation
- procedures used to remove and/or install and support luminaires

C-17.02 Installs wiring devices

- wiring devices, their applications and operation
- procedures used to remove and install wiring devices

C-17.03 Installs lighting controls

- types of lighting control components, their applications and operation
- procedures used to remove and/or install, connect and test lighting control components

C-17.04 Installs lighting standards

- lighting standards and their applications
- procedures used to remove and install lighting standards

C-17.05 Performs servicing of branch circuitry

- branch circuitry and branch circuitry components

- procedures used to service branch circuitry and branch circuitry components

C-20 Installs, services and maintains exit and emergency lighting systems

C-20.01 Installs exit and emergency lighting

- exit and emergency lighting systems, their applications and operation
- procedures used to remove and/or install exit and emergency lighting systems and their components

C-20.02 Performs servicing and maintenance of exit and emergency lighting systems

- exit and emergency lighting system, their applications and operation
- procedures used to service exit and emergency lighting systems
- procedures used to maintain exit and emergency lighting systems

C-21 Installs, services and maintains cathodic protection systems

C-21.01 Installs cathodic protection systems

- cathodic protection systems, their applications and operation
- procedures used to install, connect, and test cathodic protection systems

C-21.02 Performs servicing and maintenance of cathodic protection systems

- cathodic protection systems, their applications and operation
- procedures used to service and maintain cathodic protection systems

Transformers

36 hours

- describe basic transformers
- describe single-phase transformer construction
- connect typical dual-secondary single-phase transformers
- calculate winding turns, voltages and currents using transformer ratio formulas
- describe basic instrument transformer circuits
- calculate transformer values
- identify unmarked transformer leads
- conduct transformer impedance tests
- connect transformers in parallel
- connect autotransformers

RSOS topics covered in this section of training:

B-15 Installs, services and maintains transformers

B-15.01 Installs extra-low voltage transformers

- extra-low voltage transformers, their applications and operation
- procedures used to install extra-low voltage transformers

B-15.02 Installs low-voltage single-phase transformers

- low-voltage single-phase transformers, their applications and operation
- procedures used to install low-voltage single-phase transformers

Residential Electric Heat

6 hours

- determine residential electric heating requirements
- describe installation requirements for residential electric heating

RSOS topics covered in this section of training:

C-19 Installs, services and maintains electric heating systems

C-19.01 Installs electric heating systems

- electric heating systems, their application and operation
- procedures used to remove and/or install electric heating systems

C-19.02 Installs electric heating system controls

- types of electric heating system control components, their applications and operation
- procedures used to remove and/or install, connect and test electric heating system control components

C-19.03 Performs servicing and maintenance of HVAC systems and controls

- electric heating systems and control components
- procedures used to service electric heating systems and control components
- procedures used to maintain electric heating systems and control components

Heating and Cooling Systems

30 hours

- install residential heating and cooling systems
- service residential heating and cooling systems
- install commercial and industrial burner controls
- service commercial and industrial burner controls

RSOS topics covered in this section of training:

C-18 Installs, services, and maintains heating, ventilating and air-conditioning (HVAC) systems

C-18.01 Connects HVAC systems

- HVAC systems, their applications and operation
- procedures to disconnect and/or connect HVAC systems

C-18.02 Installs HVAC controls

- HVAC control components, their applications and operation
- procedures used to remove and/or install, connect and test HVAC control components

C-18.03 Performs servicing and maintenance of the HVAC systems and controls

- HVAC systems and controls
- procedures used to service HVAC systems and controls
- procedures used to maintain HVAC systems and controls

AC Theory and Meters

24 hours

- use analog and digital meters to measure resistance, voltage, and current
- describe power meters
- describe the principles of electromagnetic induction
- describe the operation of an elementary AC generator
- calculate instantaneous, average, and RMS values for sine waves
- compare the effects of resistance, inductive reactance and capacitive reactance in an AC circuit
- draw sine wave and phasor diagrams for AC resistive, inductive, and capacitive circuits

RSOS topics covered in this section of training:

No Specific Task in RSOS

Resistive, Inductive and Capacitive Circuits

18 hours

- sketch sine wave and phasors for parallel circuits
- solve AC parallel circuits
- calculate AC power units and power formulas
- solve AC series circuit problems

RSOS topics covered in this section of training:

No Specific Task in RSOS

Level Two topics from the RSOS that are taught in context:

A-3 Organizes work

A-4 Fabricates and installs support components

A-5 Commissions and decommissions systems

B-8 Installs, services and maintains protection devices

Canadian Electrical Code

For details regarding the In Context Topic, see page 34

Level Three

8 weeks

240 hours

Motor Starters and Controls

42 hours

- interpret schematic and wiring diagrams (for various motor control applications)
- install motor control devices (for three phase motors in manual and automatic applications)
- install advanced motor control devices (for three phase motors in manual and automatic applications)
- determine regulatory standards (motor control)

RSOS topics covered in this section of training:

D-22 Installs, services and maintains motor starters and controls

D-22.01 Installs motor starters

- motor starters and their applications
- procedures used to install and connect motor starters

D-22.02 Performs servicing and maintenance of motor starters

- motor starters and their applications
- procedures used to service and maintain motor starters

D-22.03 Installs motor controls

- motor control devices and their applications
- motor control circuits, their characteristics and applications

D-22.04 Performs servicing and maintenance of motor controls

- motor control devices and their applications
 - procedures used to service and maintain motor control devices
-

Three Phase Rectification and DC Power Supplies

36 hours

- connect three-phase wye rectifier circuits
- connect three-phase full-wave bridge rectifier circuits
- describe zener diodes
- describe bi-polar transistors
- connect voltage regulator circuits

RSOS topics covered in this section of training:

No Specific Task in RSOS

Sensors, Phase Control and Data Cabling

36 hours

- describe temperature sensing devices
- describe optical devices
- describe proximity sensing switches

-
- connect SCR phase control circuits
 - describe J-Fets and Mos-Fets
 - terminate data cabling

RSOS topics covered in this section of training:

No Specific Task in RSOS

Services for Occupancies Over 900 Square Metres

36 hours

- determine lighting requirements
- determine three-phase squirrel cage and synchronous motor branch circuits and feeders
- calculate wound rotor and continuous duty motor branch circuits and feeders
- calculate welder branch circuits and feeders
- determine services and feeders for buildings with an area exceeding 900 square metres isometric drawings
- DWV systems

RSOS topics covered in this section of training:

B-7 Installs, services and maintains consumer/supply services and metering equipment

B-7.01 Installs single-phase consumer/supply services and metering equipment

- single-phase services and their applications
- single-phase service installation methods
- load calculations for a single-phase service

B-7.03 Performs servicing and maintenance of single-phase services and metering equipment

- methods used to service and maintain single-phase service
- the theory of single-phase systems

B-11 Installs, services and maintains bonding and grounding protection systems

B-11.01 Installs grounding and bonding systems

- grounding and bonding methods and equipment
- procedures used to install grounding systems

B-11.02 Installs ground fault systems

- ground fault systems and their operation
- ground fault system installation methods

B-11.03 Installs lightning protection systems

- lightning protection systems and their operation
- lightning protection system installation

C-17 Installs services and maintains branch circuitry

C-17.01 Installs luminaires

- luminaires, their application and operation
- procedures used to remove and/or install and support luminaires

C-17.02 Installs wiring devices

- wiring devices, their application and operation
- procedures used to remove and install wiring devices

C-17.03 Installs lighting controls

- types of lighting control components, their applications and use
- procedures used to remove and/or install, connect and test lighting control components

C-17.04 Installs lighting standards

- lighting standards and their application
- procedures used to remove and install lighting standards

C-17.05 Performs servicing of branch circuitry

- branch circuitry and branch circuitry components
- procedures used to service branch circuitry and branch circuitry components

AC Motors

24 hours

- describe the construction and operation of three-phase AC motors
- connect three-phase squirrel cage motors
- connect three-phase wound rotor motors
- connect three-phase synchronous motors
- describe the maintenance requirements of three-phase motors
- describe the construction and operation of single-phase AC motors
- connect single-phase squirrel cage, split phase, induction motors
- describe single-phase repulsion motors
- describe the maintenance requirements of single-phase motors

RSOS topics covered in this section of training:

D-23 Installs, services and maintains drives

D-23.01 Installs AC drives

- types of AC drives, their applications and operation
- procedures used to install and connect AC drives

D-23.02 Performs servicing and maintenance of AC drives

- types of AC drives, their applications and operation
- procedures used to service and maintain AC drives

D-23.03 Installs DC drives

- types of DC drives, their applications and operation
- procedures used to install and connect DC drives

D-23.04 Performs servicing and maintenance of DC drives

- types of DC drives, their applications and operation
- procedures used to service and maintain DC drives

D-24 Installs, services and maintains motors

D-24.01 Installs single-phase motors

- single-phase motors, their applications and operation
- procedures used to install and connect single-phase motors

D-24.02 Performs servicing and maintenance of single-phase motors

- single-phase motors, their applications and operation
- procedures used to service and maintain single-phase motors

D-24.03 Installs three-phase motors

- three-phase motors, their applications and procedures
- procedures used to install and connect three-phase motors

D-24.04 Performs servicing and maintenance of three-phase motors

- three-phase motors, their applications and operation
- procedures used to service and maintain three-phase motors

D-24.05 Installs DC motors

- DC motors, their applications and procedures for use
- procedures used to install and connect DC motors

D-24.06 Performs servicing and maintenance of DC motors

- DC motors their applications and procedures for use
- procedures used to service and maintain DC motors

Three-Phase Theory/Alternators

33 hours

- describe AC generator principles and configurations
- describe AC generators set components
- describe AC generator terminal markings and connections
- connect three-phase loads and solve three-phase load problems
- describe AC generator operation with mixed PF loads
- describe instruments used to find frequency, phase sequence, motor rotation, shaft speed (tachometers), and insulation resistance
- connect AC generator in parallel

RSOS topics covered in this section of training:

B-12 Installs, services and maintains power generation systems

B-12.01 Installs alternating current (AC) generating systems

- AC generating systems and AC generating system components, their applications and operation
- procedures used to install and connect AC generating systems

B-12.02 Performs servicing and maintenance of AC generating systems

- AC generating systems, their applications and operation
- procedures used to service and maintain AC generating systems

Three-Phase Transformers

33 hours

- describe transformers
- describe the characteristics of various three-phase transformer connections
- determine Canadian Electrical Code requirements for transformer installations
- connect three phase transformers

RSOS topics covered in this section of training:

B-15 Installs, services and maintains transformers

B-15.03 Installs low-voltage three-phase transformers

- low-voltage three-phase transformers, their applications and operation
- procedures used to install low-voltage three-phase transformers

B-15.04 Installs high-voltage transformers

- high-voltage transformers, their applications and operation
- procedures used to install high-voltage transformers

B-15.05 Performs servicing and maintenance of transformers

- transformers, their applications and procedures for use
- procedures used to service and maintain transformers

Level Three topics from the RSOS that are taught in context:

A-3 Organizes work

A-4 Fabricates and installs support components

A-5 Commissions and decommissions systems

B-8 Installs, services and maintains protection devices

C-16 Installs, services and maintains raceways cables and enclosures

Canadian Electrical Code

For details regarding the In Context Topic, see page 34

Level Four

8 weeks

240 hours

Power Factor Correction

24 hours

- describe power factor correction
- apply power factor correction to AC induction motors
- describe power factor correction principles using synchronous motors

RSOS topics covered in this section of training:

No Specific Task in RSOS

Thyristors

24 hours

- connect a semi-converter phase control circuit and components
 - connect the inverse-parallel SCR phase control circuit and components
 - connect protective devices for transient voltages and rate-turn on
 - connect a ramp and pedestal firing circuit
 - connect a TRIAC phase control circuit and components
 - connect solid-state contactors
-

RSOS topics covered in this section of training:

No Specific Task in RSOS

Programmable Logic Controllers

36 hours

- connect standard logic gate control circuits.
- connect inverted logic gate control circuits.
- describe numbering systems used in programmable controllers.
- connect programmable logic controller hardware.
- describe programmable logic controller memory structure, addressing, and control sequence.
- program a programmable logic controller for digital control.
- program a programmable logic controller for analog control.

RSOS topics covered in this section of training:

No Specific Task in RSOS

Primary Metering and High Voltage

30 hours

- determine high voltage metering requirements
- describe high voltage installation requirements

RSOS topics covered in this section of training:

B-14 Installs high voltage equipment

B-14.01 Installs high voltage equipment

- high voltage equipment
- procedures used to install high voltage equipment
- testing procedures

B-14.02 Installs high voltage cables

- high voltage cables, their applications and operation
- procedures used to install and terminate high voltage cables
- testing procedures

B-14.03 Performs servicing and maintenance of high voltage systems

- procedures used to service and maintain high voltage equipment
 - methods used to service and maintain high voltage cables
-

Hazardous Locations

18 hours

- describe installation requirements for hazardous locations
- describe installation requirements for flammable liquid and dispensing areas
- describe installation requirements for areas of harmful and corrosive liquids
- describe installation requirements for patient care specification areas

RSOS topics covered in this section of training:

No Specific Task in RSOS

Fire Alarm Systems

30 hours

- describe fire alarm systems and components
- determine fire alarm system requirements
- determine wiring requirements for fire alarm systems
- connect typical fire alarm panels
- troubleshoot typical fire alarm systems

RSOS topics covered in this section of training:

E-26 Installs, services and maintains signalling systems

E-26.01 Installs fire alarm systems

- fire alarm systems, their applications and operation
- procedures used to install, upgrade and connect fire alarm systems and their components

E-26.02 Performs servicing and maintenance of fire alarm systems

- fire alarm systems, their applications and operation
- procedures used to service and maintain fire alarm systems

E-26.03 Installs security and surveillance systems

- security and surveillance systems, their applications and operation
- procedures used to install, upgrade and connect security and surveillance systems and their components

E-26.04 Performs servicing and maintenance of security and surveillance systems

- security and surveillance systems, their applications and operation
- procedures used to service and maintain security and surveillance systems

Building Systems

36 hours

- describe Building automation systems.
- describe UPS and surge suppression systems.
- describe renewable energy generating and storage systems.
- describe automated control systems.
- describe communication systems

RSOS topics covered in this section of training:

B-10 Installs, services and maintains power conditioning uninterruptible power supply (UPS) and surge suppression systems

B-10.01 Installs power conditioning, UPS and surge suppression systems

- power conditioning, UPS and surge suppression systems and their applications
- procedures used to install power conditioning, UPS and surge suppression systems

B-10.02 Performs servicing and maintenance of power conditioning, UPS and surge suppression systems

- powering conditioning, UPS and surge suppression systems and their applications
- procedures used to service and maintain power conditioning, UPS and surge suppression systems

B-13 Installs, services and maintains renewable energy systems

B-13.01 Installs renewable energy systems

- renewable energy systems, their applications and operation
- procedures to install and connect renewable energy systems and control system components

B-13.02 Performs servicing and maintenance of renewable energy systems

- renewable energy systems, their applications and operation
- procedures to service and maintain renewable energy systems

D-25 Installs, programs, services and maintains automated control systems

- D-25.01 Installs automated control systems
 - automated control systems, their applications and operation
 - automated control system data highway systems
 - procedures used to install and connect automated control systems and their components
- D-25.02 Performs servicing and maintenance of automated control systems
 - automated control systems, their applications and operation
 - automated control systems, data highway systems
 - procedures for service and maintenance of automated control systems
- D-25.03 Programs and configures automated control systems
 - automated control systems, their applications and operation
 - automated control systems data highway systems
 - procedures for programming and configuring automated control systems
- E-27 Installs, services and maintains communication systems**
- E-27.01 Installs voice/data/video (VDV) and community antenna television (CATV) systems
 - VDV and CATV systems, their applications and operation
 - Procedures used to install VDV and CATV systems
- E-27.02 Installs public address (PA) and intercom systems
 - PA and intercom systems, their applications and operation
 - Procedures used to install, upgrade and connect PA and intercom systems
- E-27.03 Installs nurse call systems
 - nurse call systems, their applications and operation
 - Procedures used to install nurse call systems
- E-27.04 Performs servicing and maintenance of communication systems
 - communication systems, their applications and use
 - procedures used to service and maintain communication systems
- E-28 Installs, services and maintains integrated control systems**
- E-28.01 Installs building automation systems
 - building automation systems, their applications and operation
 - procedures used to install building automation systems
- E-28.02 Installs building control systems
 - building control systems, their applications and operation
 - procedures used to install building control systems
- E-28.03 Performs servicing and maintenance of integrated control systems
 - integrated control systems, their applications and operation
 - procedures used to service and maintain integrated control systems

Three-Phase Four-Wire Services

42 hours

- describe three-phase circuit loading characteristics of 3-phase 3-wire and 3-phase 4-wire circuits
- calculate the requirements for services and feeders for buildings to be supplied with 3-phase energy
- determine electrical requirements considering conductor voltage drop
- determine the installation requirements for specialized wiring methods
- describe thermit weld conductor terminations
- describe effective trade qualification exam preparation techniques
- identify Canadian Electrical Code rules

RSOS topics covered in this section of training:

B-7 Installs, services and maintains consumer/supply services and metering equipment (Three-Phase)

- B-7.02 Installs three-phase consumer/supply services and metering equipment
 - three-phase service and their applications
 - three-phase service installation methods
 - load calculations for a three-phase service
- B-7.04 Performs servicing and maintenance of three-phase services and metering equipment

- methods used to service and maintain three-phase service
- the theory of three-phase systems

C-17 Installs, services and maintains branch circuitry (Three-Phase)

C-17.01 Install luminaires

- luminaires, their applications and operation
- procedures used to remove and/or install and support luminaires

C-17.02 Installs wiring devices

- wiring devices, their applications and use
- procedures used to remove and install wiring devices

C-17.03 Installs lighting controls

- types of lighting control components, their applications and use
- procedures used to remove and/or install, connect and test lighting control components

C-17.04 Install lighting standards

- lighting standards and their applications
- procedures used to remove and install lighting standards

C-17.05 Performs servicing on branch circuitry

- branch circuitry and branch circuitry components
- procedures used to service branch circuitry and branch circuitry components

C-17.06 Installs, services and maintains airport runway lighting systems

- runway lighting systems, their components, applications and use
- procedures used to remove and/or install airport runway lighting systems and components

C-17.07 Installs, services and maintains traffic signal lights and controls

- traffic signal light systems and control components, their applications and operation
- procedures used to remove and/or install, connect and test traffic signal light systems and control components

Level Four topics from the RSOS that are taught in context:

A-3 Organizes work

A-4 Fabricates and installs support components

A-5 Commissions and decommissions systems

B-8 Installs, services and maintains protection devices

C-16 Installs, services and maintains raceways cables and enclosures

Canadian Electrical Code

For details regarding the In Context Topic, see page 34

In Context Topics

In context means learning that has already taken place and is being applied to the applicable task. Learning outcomes for in context topics are accomplished in other topics in that level.

A-3 Organizes Work

A-3.01 Organizes project tasks and procedures

- procedures used to plan and organize work
- project costs and efficient trade practices
- job specific technology

A-3.02 Organizes materials and supplies

- procedures used to organize and maintain materials and supplies

A-4 Fabricates and installs support components

A-4.02 Installs brackets, hangers and fasteners

- brackets hangers and fasteners, their applications and their use
- measurement and layout techniques

A-4.03 Installs seismic restraint systems

- seismic restraint systems, their applications and their use

A-5 Commissions and decommissions electrical systems

A-5.01 Performs start-up and shutdown procedures

- start-up and shutdown procedures and their purpose

A-5.02 Performs commissioning and decommissioning of systems

- commissioning and decommissioning and its purpose

B-8 Installs, services and maintains protection devices

B-8.01 Installs overcurrent protection devices

- overcurrent devices, their applications and operation
- procedures used to install overcurrent devices

B-8.02 Installs ground fault, arc fault and surge protection devices

- ground fault, arc fault and surge protection devices, their applications and operation
- procedures used to install ground fault, arc fault and surge protection devices

B-8.03 Performs servicing and maintenance of ground fault, arc fault and surge protection devices

- methods and theory used to service and maintain protection devices

C-16 Installs, services and maintains raceways cables and enclosures

C-16.01 Installs conductors and cables

- types of conductors and cables and their associated components
- procedures used to remove and/or install conductors and cables

C-16.02 Installs conduit, tubing and fittings

- types of conduit, tubing and fittings, their components and applications
- procedures to remove and/or install conduit, tubing and fittings

C-16.03 Installs raceways

- types of raceways and their components
- procedures used to remove and/or install and support raceways

C-16.04 Installs boxes and enclosures

- boxes and enclosures
- procedures used to remove and/or install and support boxes and enclosures

C-16.05 Performs servicing and maintenance of raceways, cables and enclosures

- procedures to service raceways, cables and enclosures
- procedures to maintain raceways, cables and enclosures

APPENDIX A: POST HARMONIZATION TRAINING PROFILE CHART

This chart outlines the finalized model for SATCC technical training sequencing, with a cross reference to the Harmonized apprenticeship technical training sequencing, at the topic level.

Harmonization for the Construction Electrician trade has been fully implemented for each technical training level.

SATCC Level One	Transcript Code	Hours	Pan-Canadian Harmonized Level One
In Context			Organizes Work
			Protection Devices
			Canadian Electrical Code
			Commissions and Decommissions Systems
Safety and Personal Protective Equipment	SFTY 131	20	Safety Tools and Equipment
Introductory Electrical Theory and Practices	BT 131	48	Communication and Mentoring Techniques
			Support Components
Extra-Low Voltage, Magnetism and Meters	BWC 131	36	Signalling Systems
			Communication Systems
Wiring Methods	WM 130	34	Raceways, Cables, Conductors and Enclosures
Single Dwelling Plans, Lighting and Services	PLS 130	36	Distribution Equipment (Single-Phase)
			Consumer/Supply Services and Metering Equipment (Single-Phase)
			Plans, Drawings, and Specifications
Solving DC Circuits	BT 130	36	Branch Circuitry and Devices (AC/DC Introduction)
Conductors and Branch Circuits	BWC 130	30	Grounding, Bonding
		240	

SATCC Level Two	Transcript Code	Hours	Pan-Canadian Harmonized Level Two
In Context			Organizes Work
			Protection Devices
			Plans, Drawings, and Specifications
			Canadian Electrical Code
			Support Components
Commissions and Decommissions Systems			
Electronic Instruments, Rectification and Filtering	IE 222	36	Electronics (In Context)
DC Machines	EMC 225	30	Power Generating Systems Motors
Motor Starters and Controls	EMC 227	18	Motor Starters and Controls
Services Under 900 Square Meters	PLS 222	42	Grounding, Bonding
			Raceways, Cables, Conductors, and Enclosures
			Exit and Emergency Lighting Systems
			Renewable Energy Generating and Storage Systems
Cathodic Protection Systems			
Transformers	TRNS 220	36	Transformers
Residential Electric Heat	HC 220	6	Branch Circuitry and Devices
			Electric Heating Systems and Controls
Heating and Cooling Systems	HC 221	30	Heating, Ventilation, and Air Conditioning
AC Theory and Meters	BT 220	24	Exceed
Resistive, Inductive and Capacitive Circuits	BT 224	18	Exceed
		240	

SATCC Level Three	Transcript Code	Hours	Pan-Canadian Harmonized Level Three
In Context			Organizes Work
			Protection Devices
			Plans, Drawings, and Specifications
			Canadian Electrical Code
			Support Components
			Raceways, Cables, Conductors, and Enclosures
			Commissions and Decommissions Systems
AC Motors	EMC 326	24	Motors Drives
Three-Phase Theory/Alternators	BT 325	33	Power Generating Systems
Motor Starters and Controls	EMC 325	42	Motor Starters and Controls
Three-Phase Rectification and DC Power Supplies	IE 322	36	Electronics
Sensors and Phase Control and Data Cabling	IE 323	36	Electronics
Services for Occupancies Over 900 Square Metres	PLS 323	36	Grounding, Bonding
			Branch Circuitry and Devices
			Consumer/Supply Services and Metering Equipment
			Distribution Equipment
Three Phase Transformers	TRNS 322	33	Transformers
		240	

SATCC Level Four	Transcript Code	Hours	Pan-Canadian Harmonized Level Four
In Context			Organizes Work
			Protection Devices
			Plans, Drawings, and Specifications
			Canadian Electrical Code
			Support Components
			Raceways, Cables, Conductors, and Enclosures
			Commissions and Decommissions Systems
Fire Alarm Systems	FA 420	30	Signaling Systems
Power Factor Correction	BT 426	24	Electronics
Thyristors	IE 425	24	Electronics
Programmable Logic Controllers	IE 427	36	Programmable Logic Controllers
Primary Metering and High Voltage	HVM 424	30	High Voltage Systems
Three-Phase Four-Wire Services + Code Review	PLS 424	42	Branch Circuitry and Devices
			Grounding, Bonding, Ground Fault Detection Systems
			Canadian Electrical Code
			Motors
Building Systems	BLDG 400	36	Renewable Energy Generating and Storage Systems
			Communication Systems
			Consumer/Supply Services and Metering Equipment
			Distribution Equipment
			UPS and Surge Suppression Systems
Hazardous Locations	WM 420	12	Exceed
		240	

Exceed Topics

Throughout this guide to course content there are topics which exceed the minimum scope of work as set out in the Plumber RSOS. Industry in Saskatchewan has deemed certain topics to fall within the scope of work of the Plumber trade in Saskatchewan and therefore require technical training to cover these topics.