Workplace Electives

A minimum of 35 credits are required from the Workplace Elective Competency Standards

You may begin collecting credits for elective competency standards once you have completed any prerequisite competency standards and have the knowledge and skills to be assessed.

IE Code	IE Competency Title	Credit	OAC Ref.
IE109-9WE	Use jumpers and forces safely	3	B6
IE149-9WE	Install and maintain computer networks	3	K4
IE153-9WE	Install and maintain high voltage circuits	12	N4
IE159-9WE	Install and maintain pumps	2	I7
IE161-9WE	Troubleshot and maintain power generation prime movers	5	P4
IE166-9WE	Maintain portable generators	3	P5
IE167-9WE	Maintain portable electric welding equipment	3	P6
IE169-9WE	Install and maintain servo and proportional valve control loops	3	Q5
IE170-9WE	Install and maintain encoders	3	Q8
IE171-9WE	Install and maintain numeric controllers	3	Q9
IE173-9WE	Install and maintain data and process monitoring systems	3	Q17
IE174-9WE	Install and maintain hydraulic and pneumatic controls	3	Q6
IE177-9WE	Install and maintain Robotic Control Systems	3	I9
IE180-9WE	Install and maintain DC drive systems	9	J7
IE182--9WE	Install and maintain power supplies	9	O2
IE187-9WE	Install and maintain video monitoring systems	4	Q18
IE189-9WE	Maintain crane control systems	4	Q10
IE191-9WE	Install and maintain boiler furnace system monitors and controls	6	Q11
IE193-9WE	Install and maintain DC electric motors	9	L5
IE195-9WE	Maintain electronic precipitators	5	I8
IE197-9WE	Use powder actuated tools	1	C4
IE198-9WE	Operate personnel lifting devices	1	C9
IE199-9WE	Use liquid-fuel powered tools	1	C7
IE200-9WE	Install and maintain wound rotor drives	7	J8
IE201-9WE	Install and maintain wireless radio controllers	4	Q12
IE202-9WE	Maintain portable switch houses	4	N5
IE203-9WE	Demonstrate knowledge of line installation, maintenance, and repair procedures	3	N6
IE204-9WE	Install and maintain wheel motors	9	L6
IE205-9WE	Make-up and repair trailing cable (4160 – 13.8kV and 2300 – 600V)	3	N7
IE206-9WE	Install and maintain a Global Positioning System (GPS)	3	Q13
IE208-9WE	Maintain electric arc furnace	3	R1
IE209-9WE	Maintain induction furnace	3	R2
IE210-9WE	Demonstrate knowledge of electrolytic cell technology and safety considerations	2	O5
IE211-9WE	Access and comply with mining electrical regulations	2	G4
IE212-9WE	Install and maintain gas detection equipment	4	Q14
IE213-9WE	Install and maintain controls for liquid separation and refractionation	4	Q15

IE215-9WE	Install and maintain gas metering equipment	4	Q16
IE217-9WE	Install and maintain analytical measurement equipment	4	Q7
IE218-9WE	Demonstrate and apply knowledge of onshore pipeline regulations	2	G5
IE220-9WE	Maintain recovery boiler control systems	3	R3
IE223-9WE	Install and maintain scanning and optimization equipment	4	R4

Assessment

With training and guidance you will acquire the skills and knowledge to enable you to competently demonstrate completion of these tasks to your assessor. You must keep a record, on the diary pages included, of the details of the work done when completing the tasks to help the assessor see the experience you have gained prior to the assessment decision being made.

Evidence

Assessment of this standard requires the following types of evidence be gathered by you and presented by you to your assessor:

- Completed apprentice work diary for each task – add more pages if you need to
- Observation by the assessor of you completing the relevant tasks
- Task verification – another person who has observed you completing the tasks to the appropriate standard
- Copies of work records, where applicable, or reference to work records to show when the tasks were completed.

The specific evidence requirements you must present are listed on the following pages.

SPECIFICATION

People credited with this standard are able to:

- **Follow procedures for working safely with jumpers and forces.**

Credit 3

Prerequisite

Competency Standard IE107-1TC, Demonstrate knowledge of electrical safety.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)

WorkSafeBC Occupational Health & Safety (OHS) regulations.

Sector References

Mines Act BC

Use of Electricity in Mines (CSA).

Definitions

jumper – temporary hardware link

force – temporary software link.

Task 1: Use jumpers and forces safely using permits, authorizations sheet, and change management system.

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:
B6 Use jumpers and forces safely

Task 1: Use jumpers and forces safely using permits, authorizations sheet, and change management system.

Note: a simulation of forcing a software contact and jumper control strategy change may be appropriate for assessment if no safely supervised opportunity for assessment otherwise presents itself.

Apprentice Diary (1.1 – 1.3)

Date/s	Outline an event to be used for assessment, where jumpers and forces have been used. Include: 1. Overview of job 2. Details of permits obtained and documentation completed (1.1) 3. The installation – including safety aspects and communication of the effects of the installation to relevant stakeholders and any choices you made (1.2) 4. The details of how the changes effected logic and control strategy, including: (1.3) • logic checks • logic change when required • appropriately documented • awareness of effects of jumper • force or logic edit on equipment operation.

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Permits were obtained to use jumpers and forces and documentation requirements completed. (1.1)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Jumpers and forces were installed in accordance with requirements and industry practice: (1.2)

- ☐ safety hazards for jumpers and forces were identified/observed
- ☐ communicating hazards to other personnel were identified/observed.

Note: a simulation of force and jumper application may be appropriate for assessment if no safely supervised opportunity for assessment otherwise presents itself.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Changes in control strategy when using jumpers and forces were managed: (1.3)

- ☐ logic checks were identified
- ☐ logic changes when required were made
- ☐ changes appropriately documented
- ☐ awareness of effects of jumper was demonstrated
- ☐ awareness of force or logic edit effect on equipment operation was demonstrated.

Note: a simulation of forcing a software contact, and jumper control strategy change may be appropriate for assessment if no safely supervised opportunity for assessment otherwise presents itself.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Install and maintain reliably networked equipment and devices in an efficient manner.**

Credit 3

Prerequisite

The following competency standards are not prerequisites but are recommended:

Competency Standard IE148-4TC, Demonstrate and apply knowledge of communications protocols;

Competency Standard IE135-3TC, Demonstrate and apply knowledge of communication buses and PLC interfaces; and

Competency Standard IE147-4TC, Demonstrate and apply knowledge of network diagnostic tools

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)

WorkSafeBC Occupational Health and Safety (OHS) regulations.

Task 1: Demonstrate and apply knowledge of the principles of both wired and wireless networks, factors dictating installation types and required components for efficient function.

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:

K4 Install and maintain computer networks

Task 1: Demonstrate and apply knowledge of the principles of both wired and wireless networks, factors dictating installation types and required components for efficient function.

Part 1 - Knowledge test (1.1)

On the following page, sketch/draw (without copying) two schematic drawings or a combination wired/wireless drawing that shows:

1. a wired network
2. a wireless network.

Include the following (use extra paper if necessary):

- a minimum of 2 PC workstations forming a workgroup
- a server
- switches as required
- firewalls

Note: use extra paper if necessary

Space for network schematic drawing **(1.1)**

Part 2

- Place and wire network components and workstations
- Install wireless networks and describe basic features of operation

Apprentice Diary (1.2. 1.3)

Date/s	Describe the network that you have installed that will be used for this assessment, including: • specification(design/conventions/terminations etc) • components and features of the network Explain any choices you have made. Attach copies of specification/ drawings/workshop sketches if available as supporting evidence. Provide details of work completed and dates. Include: Cat 5E cabling (or equivalent+)
	Description
	Specification overview
	Dates of installation and details of work carried out

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Correctly demonstrated knowledge of the principles of network and inter-network communication by sketch without copying or reference: (1.1)

- ☐ workstations were included
- ☐ workgroups were correctly located/laid out in the schematic
- ☐ server/s were correctly located in the schematic
- ☐ switches were correctly located in the schematic
- ☐ firewalls were correctly located in the schematic.

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Placed and wired network components and workstations. (1.2)

- ☐ installed cat 5e cabling
- ☐ conventions and terminations made
- ☐ network design and security was functional and complied with all regulatory/safety requirements.

Note: Wiring may also include: fibre optics, co-axial, teck cable, Cat 6 cable.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Installed wireless networks and described basic features of operation. (1.3)

Note: This may include explaining features such as 802.11b g n communications protocols; standards for equipment placement; device and network limitations.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Install, maintain and document high voltage circuits to code standards and all applicable installation guidelines.**

Credit 12

Prerequisite

Competency Standard IE152-4TC, Demonstrate knowledge of installation and maintenance of high voltage circuits

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)

WorkSafeBC Occupational Health and Safety (OHS) regulations.

Definitions

High voltage is any voltage above 750v

OCB – Oil circuit breaker.

Task 1: **Install, document and maintain high voltage circuits to CEC rules and manufacturer specifications.**

Task 2: **Install and maintain high voltage distribution centre equipment to CEC rules and manufacturer specifications.**

Task 3: **Select, install and maintain protective relays on power distribution equipment, to CEC rules and manufacturer guidelines.**

This is a large competency standard and the assessment is divided into 6 parts.
Each part includes a work diary and then an assessor observation. The parts are:

- Installation of high voltage circuits
- Maintenance of high voltage circuits
- Installation of high voltage distribution centre equipment
- Maintenance of high voltage distribution centre equipment
- Installation of protective relays on power distribution equipment
- Maintenance of protective relays on power distribution equipment.

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:

N4 ***Install and maintain high voltage circuits***

Task 1: Install, document and maintain high voltage circuits to CEC rules and manufacturer specifications.

Apprentice Diary – High voltage circuit installation **(1.1)**

Date/s	Description of high voltage installations worked on and dates. Include reference to the documentation used for the installation and explain any choices you have made – the assessor observation section of this assessment includes the range of installation aspects that should be covered:

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ The apprentice has installed high voltage circuits to CEC rules and completed appropriate documentation in accordance with company standards: (1.1)

- ☐ testing equipment was used correctly
- ☐ terminations were done correctly
- ☐ wiring was laid out and secured correctly
- ☐ wiring was run correctly
- ☐ control points were installed correctly
- ☐ environmental specifications met.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Apprentice Diary – High voltage circuit maintenance (1.2)

Date/s	Description of high voltage maintenance worked on and dates. Include reference to the documentation used for the maintenance and explain any choices you have made – the assessor observation section of this assessment includes the range of maintenance aspects that should be covered:

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ High voltage circuits were maintained to CEC rules and appropriate documentation completed in accordance with company standards: (1.2)

- ☐ testing equipment was used correctly
- ☐ environmental specifications met.

The following parts of the circuits were checked/maintained:

- ☐ control points
- ☐ circuit breakers
- ☐ arc chutes
- ☐ sequencing
- ☐ symmetrical and asymmetrical load rating
- ☐ breaker safety features
- ☐ OCB oil deterioration
- ☐ contact resistance checks.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 2: Install and maintain high voltage distribution centre equipment to CEC rules and manufacturer specifications.

Apprentice Diary – High voltage distribution centre installation (2.1)

Date/s	Description of work done to install power distribution equipment and dates. Include reference to the documentation completed and explain any choices you have made – the assessor observation section of this assessment includes the range of maintenance aspects that should be covered:

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Installed power distribution equipment to CEC rules and completed appropriate documentation to company standards: (2.1)

- ☐ load calculations were completed
- ☐ environmental factors were taken into account
- ☐ wiring, shielding and bonding was carried out correctly
- ☐ manufacturer specifications and manuals were accessed and referred to
- ☐ installation was tested and tuned
- ☐ installation was secured and restrained.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:***_____

Assessor Signature: _____ ***Date:***_____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

Apprentice Diary – High voltage distribution centre maintenance (2.2)

Date/s	Description of maintenance work done on high voltage distribution centres and dates. Include reference to the documentation completed and explain any choices you have made – the assessor observation section of this assessment includes the range of maintenance aspects that should be covered:

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Power distribution centre equipment was maintained in accordance with CEC rules and appropriate documentation was completed to company standards: (2.2)

- ☐ testing and troubleshooting was carried out on equipment
- ☐ components were protected and cleaned
- ☐ safety procedures for component replacement were adhered to
- ☐ grounding was checked
- ☐ manufacturer specs were followed
- ☐ preventative maintenance was carried out in accordance with specified routines.

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

***Assessor/ verifier name:*_____ *Signature:*_____ *Date:* _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 3: Select, install and maintain protective relays on power distribution equipment, to CEC rules and manufacturer guidelines.

Apprentice Diary – Installing protective relays on power distribution equipment (3.1)

Date/s	Description of relay installation work done and dates. Include reference to the documentation completed and explain any choices you have made – the assessor observation section of this assessment includes the range of maintenance aspects that should be covered:

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Installed protective relays to CEC rules and completed appropriate documentation to company standards: (3.1)

- ☐ prints and schematics were read and modified as required
- ☐ manuals and specifications were accessed and interpreted
- ☐ overcurrent/undercurrent states were determined and set
- ☐ safety procedures were followed correctly.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Apprentice Diary – Maintaining protective relays on power distribution equipment (3.2)

Date/s	Description of relay maintenance work done and dates. Include reference to the documentation completed and explain any choices you have made – the assessor observation section of this assessment includes the range of maintenance aspects that should be covered:

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Protective relays were maintained to CEC rules and appropriate documentation was completed to company standards: (3.2)

- ☐ trip logs were accessed and interpreted
- ☐ safe working procedures were followed.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Install and maintain pumps, sub-surface and surface; i.e. deep well, de-watering, compressor.**

Credit 2

Prerequisite

Competency Standard IE158-4TC, Demonstrate knowledge of pumps.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)

WorkSafeBC Occupational Health and Safety (OHS) regulations

BC Plumbing Code, 2006.

Task 1: **Install surface and sub-surface pumps to CEC rules and manufacturer specifications.**

Task 2: **Maintain surface and sub-surface pumps to CEC rules and manufacturer specifications.**

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:
I7 ***Install and maintain pumps***

Task 1: Install surface and sub-surface pumps to CEC rules and manufacturer specifications.

Note: re-installing may be used to assess competency on installing as long as all installation considerations are demonstrated.

Apprentice Diary – Pump installation (1.1)

Date/s	Description of pump installation work done over a period of time. Include details of any diagrams and drawing used, installation tasks performed for 1 surface and 1 sub-surface pump, the following information and explain any choices you have made: • power supplies • grounding • insulation • confined space procedures • BC plumbing code standards • line up

What documentation was supplied to support the installations? (1.2)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Installed pumps to CEC rules: (1.1)

- ☐ connected power supply in accordance with CEC rules
- ☐ grounded pump/s in accordance with CEC rules
- ☐ insulated pump or checked insulation of pump complies with CEC rules
- ☐ complied with confined space procedures in accordance with WorkSafeBC regulations
- ☐ complied with BC plumbing code
- ☐ aligned pump correctly.

Note: re-installing may be used to assess competency on installing as long as all installation considerations are demonstrated.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Documented the installation to company standards. (1.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 2: Maintain surface and sub-surface pumps to CEC rules and manufacturer specifications.

Apprentice Diary – Pump maintenance (2.1)

Date/s	Description of work done over a period of time. Include details of maintenance carried out and specification of the maintenance tasks for 1 surface and 1 sub-surface pump, and explain any choices you have made.

What documentation was supplied to support the maintenance? (2.2)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Maintained pumps to CEC rules: (2.1)

- ☐ maintained sealed motors in accordance with CEC rules
- ☐ maintained controllers in accordance with CEC rules
- ☐ maintained pressure and control circuits in accordance with CEC rules
- ☐ pump is maintained to avoid cavitation
- ☐ complied with confined space procedures in accordance with WorkSafeBC regulations.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Documented the installation. (2.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Troubleshoot a prime mover problem and record a preventative maintenance procedure for a common type of prime mover.**

Credit 5

Prerequisite

Competency Standard IE160-4TC, Demonstrate knowledge of power generation equipment.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)

WorkSafeBC Occupational Health and Safety (OHS) regulations.

Task 1: **Troubleshoot a prime mover problem, maintain and record a preventative maintenance procedure for a common type of prime mover.**

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:

P4 ***Troubleshoot and maintain power generation prime movers***

Task 1: Troubleshoot a prime mover problem, maintain and record a preventative maintenance procedure for a common type of prime mover.

Apprentice Diary – Troubleshooting prime movers (1.1)

Indicative troubleshooting areas that may be used include:

- gas turbines
- reciprocating engines
- diesel turbines
- hydro turbines
- steam turbines
- wind turbines
- dynamic and static specifications
- equipment manufactures service manuals.

Date/s	Description of troubleshooting work done on prime movers over a period of time. (1.1) Include dates and: • details of the prime mover • type of installation • types of maintenance • how you identified the problem • reference documentation used

Apprentice diary – Maintaining prime movers (1.2)

The following indicative aspects of prime mover maintenance may be included:

- combustion engine operation and fluid checks
- turbine bearings and oil cooling
- regulation equipment
- generators and alternators
- test dynamic and static operation
- adjust control parameters
- consult and update drawings and schematics
- switching operations and plant procedures
- record load – up and synchronization time of generators
- preventative maintenance schedules
- offline and shut down procedures
- insulation and resistance checks on rotors, stators and diodes.

Date/s	Description of maintenance work done on prime movers over a period of time. (1.2) Include dates and: • details of the prime mover • type of installation • types of maintenance • maintenance tasks performed • reference documentation used • explain any choices you have made.

Documentation

Provide details of or attach samples of documentation to support the troubleshooting and maintenance work and preventative maintenance procedure. (1.3)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

- ☐ Completed troubleshooting for prime movers using logical techniques in accordance with industry practice. (1.1)
- ☐ Maintained prime movers in accordance with industry practice. (1.2)
- ☐ Documented maintenance procedures in accordance with company standards. (1.3)
- ☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name: _____ ***Signature:*** _____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Maintain portable generators to original equipment manufacturer specifications and to the specific needs of field operations.**

Credit 3

Prerequisite

Competency Standard IE165-4TC, Demonstrate knowledge of portable generator equipment and portable electric welding equipment

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)

WorkSafeBC Occupational Health and Safety (OHS) regulations.

Task 1: Maintain portable generator sets to ensure safe and reliable operation.

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:
P5 ***Maintain portable generators***

Task 1: Maintain portable generator sets to ensure safe and reliable operation.

Apprentice Diary – Maintenance (1.1)

Date/s	Description of maintenance work done on generator sets over a period of time. Include details of the reference diagrams and drawing used, and installation and maintenance tasks performed and explain any choices you have made. Maintenance events must include: • service and repair internal combustion engine faults • service and repair generating equipment faults • wiring and relay faults, mechanical connectors, starting mechanisms and batteries • fusing and breakers.

Provide details of documentation completed to support the maintenance work done (1.2)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice maintained portable generators in a safe and reliable state to meet the specific needs of field operations in accordance with manufacturer specifications and industry practice: (1.1)

- ☐ internal combustion engines were serviced and faults repaired
- ☐ generating equipment was serviced and faults repaired
- ☐ wiring and relay faults were identified/repaired
- ☐ mechanical connectors were serviced/repaired as required
- ☐ starting mechanisms and batteries were serviced/repaired as required
- ☐ fusing and breakers were serviced/repaired as required.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Maintenance on portable generator sets was documented according to company standards. (1.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Maintain portable welding equipment to manufacturer specifications.**

Credit 3

Prerequisite

Competency Standard IE165-4TC, Demonstrate knowledge of portable generator equipment and portable electric welding equipment.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)

WorkSafeBC Occupational Health and Safety (OHS) regulations.

Definitions

MIG – metal inert gas

TIG – tungsten inert gas.

Task 1: Maintain portable electric welders to operate safely and reliably in field conditions and document preventative maintenance carried out.

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:

P6 Maintain portable electric welding equipment

Task 1: Maintain portable electric welders to operate safely and reliably in field conditions and document preventative maintenance carried out.

The following areas of maintenance competence must be included:

- diesel or main supply
- AC/DC power supply
- Transformer
- TIG
- MIG
- electric arc
- access manufacturer specifications and maintenance guidelines
- electronic control board and mounts
- capacitor connections
- control rheostat
- transformer and wiring connections
- cooling and fusing
- test welds
- thick and thin rods
- variety of alloys
- rectifier check.

Apprentice Diary – Maintain portable electric welders (1.1)

Date/s	Description of maintenance work done on portable welders. Include reference to the above bulleted areas of maintenance competence and explain any choices you have made.

Provide details of **documentation of preventative maintenance** carried out on portable welding equipment to company standards (1.2)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Maintained portable welding equipment in accordance with manufacturer specifications and industry best practice: (1.1)

- ☐ diesel or main fuel supply to fuel powered welders were maintained
- ☐ AC/DC power supply was checked
- ☐ transformer system and wiring connections were maintained/checked
- ☐ TIG welder/s were maintained
- ☐ MIG welder/s were maintained
- ☐ electric arc welder/s were maintained
- ☐ manufacturer specifications were accessed/referred to correctly during maintenance
- ☐ electronic control board/mounts were inspected/ maintained accordingly
- ☐ capacitor connections were inspected/ maintained accordingly
- ☐ control rheostat/s were inspected/maintained accordingly
- ☐ cooling and fusing systems were inspected/maintained accordingly
- ☐ test welds were used to confirm correct operation of maintained equipment
- ☐ a variety of equipment operation settings were checked (including thick and thin rods)
- ☐ a variety of alloys were test welded to confirm correct operation
- ☐ rectifier was checked.

Note: Maintained includes preventative maintenance.

☐ Preventative maintenance was documented in accordance with company standards. (1.2)

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Install and maintain servo and proportional valve control loops in accordance with CEC rules and manufacturer specifications.**

Credit 3

Prerequisite

Competency Standard IE168-4TC, Demonstrate knowledge of control systems.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)

WorkSafeBC Occupational Health and Safety (OHS) regulations

Task 1: **Install servo and proportional valve control loops to CEC rules and equipment manufacturer specifications.**

Task 2: **Maintain servo and proportional valve control loops to CEC rules and equipment manufacturer specifications.**

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:

Q5 ***Install and maintain servo and proportional valve control loops***

Task 1: Install servo and proportional valve control loops to CEC rules and equipment manufacturer specifications.

Apprentice Diary – Valve control loop installation (1.1, 1.2)

Date/s	Description of valve loop installation work done over a period of time. Include the type of system controlled and primary details of the system/s – may be hydraulic or pneumatic. Outline: 1. **Preparatory factors** including CEC rules, safety procedure and component/ system manufacturer specifications that apply. (1.1) 2. Installation details (1.2) • what you installed • the references used (component/system manufacturer specs/drawings etc) • dates of installation • equipment used • wiring/control loop details • safety precautions taken (air, oil and electrical) • explain any choices you have made. *Note One installation must include proportional valve control.* You may prefer to attach specifications/drawings/work records to supplement your diary. *Note: You may undertake a re-installation that involves all the same processes as a new installation as an assessment event if a new installation is not possible.*

Provide details of the testing processes including verification of correct operation in relation to setpoints and allowable parameters. (1.3)

Provide detail of the documentation prepared to support the control loop installation. (1.4)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ The apprentice prepared for installation of servo and proportional valve control loops: (1.1)

- ☐ relevant safety procedures were identified
- ☐ manufacturer operating specifications for equipment/system were located
- ☐ relevant CEC rules were identified.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ The apprentice installed servo and proportional valve control loops in accordance with industry practice: (1.2)

- ☐ proportional valve control circuit installed
- ☐ controls verified
- ☐ operating parameters interpreted correctly
- ☐ wiring done in accordance with industry practice
- ☐ shielding and grounding done in accordance with industry practice
- ☐ valve control calibrated by bench test
- ☐ calibration safe state correctly determined
- ☐ safety procedures for working with live circuits were observed (air, fluid and electrical) test equipment was used to calibrate installation and any feedback errors were analyzed.

Note: re-installing may be used to assess competency on installing as long as all installation considerations are demonstrated.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ A full range of verification of performance was carried out and operating parameters set within specification. (1.3)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Installation of circuit components was documented in accordance with company standards. (1.4)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 2: Maintain servo and proportional valve control loops to CEC rules and equipment manufacturer specifications.

Apprentice Diary – Valve control loop maintenance (2.1, 2.2)

Date/s	Describe details and dates of valve control loop maintenance activities undertaken – explain any choices you have made. Include: • reference/details of CEC rules and equipment manufacturer's specifications. • control loop operating parameters • calibration and bench set process • safety procedures followed (air, fluid and electrical) • test equipment used for calibration and troubleshooting • wiring/shielding/grounding details

Provide details of the documentation prepared to record the maintenance event to comply with company standards. (2.3)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

- ☐ Apprentice has accessed service manuals and documentation relating to service routine for components in valve control loop. (2.1)
- ☐ Maintained proportional valves and control loops according to industry practice: (2.2)
  - ☐ proportional valve control circuits maintained
  - ☐ operating parameters set valve control calibrated (bench set)
  - ☐ calibration safe state
  - ☐ safety procedures for working with live circuits were followed (fluid, air and electrical)
  - ☐ test equipment was used to calibrate installation and any feedback errors were analyzed
  - ☐ wiring, shielding and grounding was maintained/checked appropriately.
- ☐ Maintenance was documented in accordance with company standards. (2.3)
- ☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name: _____ ***Signature:*** _____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Install and maintain encoders**

Credit 3

Prerequisite

Competency Standard IE168-4TC, Demonstrate knowledge of control systems.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)

WorkSafeBC Occupational Health and Safety (OHS) regulations.

Definitions

PLC – programmable logic controller.

Task 1: **Install an encoder on machinery, set up, and test in accordance with CEC rules and manufacturer specifications.**

Task 2: **Maintain encoders on machinery to CEC rules and equipment manufacturer specifications**

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:
Q8 ***Install and maintain encoders***

Task 1: Install an encoder on machinery, set up, and test in accordance with CEC rules and manufacturer specifications.

Installing encoders

Identify the relevant safety procedures, manufacturer operating instructions and CEC rules that apply to the encoder installation being used for your assessment. (1.1)

Note: re-installing may be used to assess competency on installing as long as all installation considerations are demonstrated.

Apprentice Diary – Encoder installation (1.2)

Date/s	Describe the encoder installation and setup work done and the dates. Explain any choices you have made and include: • safety procedure • machinery lock out • set up with PLC programming software • set up adjustments • set up with test equipment.

What documentation was completed to support the encoder installation? (1.3)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice prepared for the installation of encoders: (1.1)

- ☐ safety procedures were determined
- ☐ manufacturer operating specifications were accessed
- ☐ relevant CEC rules were identified.

Assessor/ verifier name: _____ ***Signature:*** _____ ***Date:*** _____

☐ Apprentice installed encoders in accordance with CEC rules: (1.2)

- ☐ safety procedures were carried out
- ☐ machinery lockout process was followed
- ☐ encoder was set up with PLC programming software
- ☐ encoder was setup using test equipment as required.

Note: re-installing may be used to assess competency on installing as long as all installation considerations are demonstrated.

Assessor/ verifier name: _____ ***Signature:*** _____ ***Date:*** _____

☐ Apprentice documented installation in accordance with company standards. (1.3)

Assessor/ verifier name: _____ ***Signature:*** _____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name: _____ ***Signature:*** _____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 2: Maintain encoders on machinery to CEC rules and equipment manufacturer specifications.

Apprentice Diary – Encoder maintenance (2.1)

Date/s	Provide details of encoder maintenance and maintenance dates. Explain any choices you have made and include: • safety procedure • machinery lock out procedure • diagnosis and set up with PLC programming software • diagnosis and set up with test equipment • manufacturer service manuals used • parts sourced and ordered.

What documentation was completed to support the encoder maintenance? (2.2)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Encoders were maintained in accordance with industry practice: (2.1)

- ☐ safety procedure was followed
- ☐ machinery lockout process was followed
- ☐ encoder was diagnosed and setup using PLC programming software
- ☐ encoder was diagnosed using test equipment as required
- ☐ service manuals were accessed
- ☐ parts required for maintenance were sourced and ordered.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Encoder maintenance was documented in accordance with company standards. (2.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Install and maintain numeric controllers.**

Credit 3

Prerequisite

Competency Standard IE168-4TC, Demonstrate knowledge of control systems; and

Competency standard IE138-3TC, Demonstrate knowledge of programming language and of installing and maintaining PLC software.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)

WorkSafeBC Occupational Health and Safety (OHS) regulations.

Definitions

CAD – computer aided design
CNC – computer numerical control
PLC – programmable logic controller
PC – personal computer.

Task 1: **Install numeric controllers including programming controllers for different purposes.**

Task 2: **Maintain numeric controllers including programming controllers for different purposes.**

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:
Q9 ***Install and maintain numeric controllers***

Task 1: Install numeric controllers including programming controllers for different purposes.

Apprentice Diary – Installation (1.1, 1.2)

Date/s	Describe the following numeric controller installation information: • controller and the machine that you installed it to and dates of installation • software loaded onto the controller and any manual programming setup that was required • documentation completed to support the installation • include servo motors and control signal • explain any choices you have made. *Note: Could be a controller for any CNC type machine such as router mill etc.*

What documentation was completed to support the encoder installation? (1.3)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice has installed and connected numeric controllers: (1.1)

- ☐ numeric controller controls servo motor/s
- ☐ control signal feedback interpreted.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice loads programs and adjusts them using PC (1.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice documented program to company standards. (1.3)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 2: Maintain numeric controllers including programming controllers for different purposes

Apprentice Diary – Maintenance (2.1)

Date/s	Describe maintenance of controllers and relevant dates. Explain any choices you have made and include: • programming troubleshooting activities • read and writing of part programs • details of references used (equipment specifications etc) • adjustment of programming to repurpose machinery undertaken • use of CAD drawings to program controllers – identify drawings used.

Describe the documentation prepared to support the maintenance work done. (2.2)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice maintained numeric controllers by reading and writing controller software: (2.1)

- ☐ programming was troubleshot
- ☐ part programs were read/written/adjusted
- ☐ specifications were referenced/accessed
- ☐ programming was adjusted to repurpose machinery
- ☐ CAD drawings were converted to controller language and installed.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Maintenance was documented in accordance with company standards. (2.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Program, install and maintain data process monitoring systems.**

Credit 3

Prerequisite

Competency Standard IE168-4TC, Demonstrate knowledge of control systems.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)
WorkSafeBC Occupational Health and Safety (OHS) regulations.

Definitions

DDC – direct digital control
GUI – graphical user interface
HMI – human machine interfaces
PLC – programmable logic controller
SCADA – supervisory control and data acquisition.

Task 1: **Program SCADA systems, DDC and monitoring systems in accordance with industry practice.**

Task 2: **Install SCADA systems, DDC and monitoring systems in accordance with industry practice.**

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:
Q17 ***Install and maintain data and process monitoring systems***

Task 1: Program SCADA systems, DDC and monitoring systems in accordance with industry practice.

Apprentice Diary – Programming (1.1)

Date/s	Description of programming work done for a SCADA control system and for a DDC system. Explain any choices you have made and include: • details of the reference specifications and specs used • dates • programming languages used – must include C++, Visual Basic, block diagrams, ladder logic.

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice has programmed SCADA and DDC systems: (1.1)

- ☐ C++ language used to program
- ☐ Visual Basic used to program
- ☐ functional block diagrams are developed
- ☐ ladder logic programming is used.

Assessor/ verifier name: _____ ***Signature:*** _____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name: _____ ***Signature:*** _____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 2: Install SCADA systems, DDC and monitoring systems in accordance with industry practice.

Apprentice Diary – Installation (2.1 – 2.4)

Date/s	Description of SCADA and DDC installation work done over a period of time. Explain choices you have made and include: • adjusting logic programming • wiring, shielding and bonding of equipment Include information about the following elements of installation: 3. Build and programming of GUI on HMI (person/system interface) (2.1) 4. Test and adjustment of GUI on HMI. (person/system interface) (2.2) 5. Testing and adjustment of system feedback loops (2.3) 6. Application of signal conditioning and scaling to blocks. (2.4)

What documentation has been prepared to support the installation of the SCADA and DDC systems? (2.5)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice installed SCADA systems, DDC and monitoring systems in accordance with industry practice: (2.1)

- ☐ logic programming was adjusted.
- ☐ systems were wired, shielded and bonded.
- ☐ system was built and programmed to enable good user/system interface.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ The person/system interface was tested. (2.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ System feedback loops were tested and adjusted as required. (2.3)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Signal conditioning and scaling was applied to blocks. (2.4)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ installation was documented in accordance with company standards. (2.5)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 3: Maintain SCADA systems, DDC and monitoring systems in accordance with industry practice.

Apprentice Diary – Maintenance (3.1)

Date/s	Description of maintenance work done on the systems over a period of time. Explain any choices you have made and include: 7. testing and programming adjustments (3.1) 8. signal conditioning and scaling (3.2) 9. verification through loop checks (3.3)

What documentation has been prepared to support the maintenance of the SCADA and DDC systems? (3.4)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Tested and adjusted programming for optimal process control. (3.1)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Applied signal conditioning and scaling to blocks. (3.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Verified operation through loop checks. (3.3)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Documented maintenance in accordance with company standards. (3.4)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Install and maintain electrical/electronic control circuits (including electrical and electronic pumps and compressors) that operate hydraulic or pneumatic machines.**

Credit 3

Prerequisite

Competency Standard IE168-4TC, Demonstrate knowledge of control systems.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)

WorkSafeBC Occupational Health and Safety (OHS) regulations.

Definitions

PLC – programmable logic controller.

Task 1: **Install hydraulic or pneumatic circuit controls on machinery and equipment to CEC rules and manufacturer specifications.**

Task 2: **Maintain hydraulic or pneumatic circuit controls on machinery and equipment to CEC rules and manufacturer specifications.**

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:

Q6 ***Install and maintain hydraulic and pneumatic controls***

Task 1: Install hydraulic or pneumatic circuit controls on machinery and equipment to CEC rules and manufacturer specifications.

Note: re-installing may be used to assess competency on installing as long as all installation considerations are demonstrated.

Identify the safety procedures, relevant CEC rules and manufacturer specifications associated with the planned installation: (1.1)

Apprentice Diary – Installation (1.2)

Date/s	Description of circuit control installation work done. Include dates of work, safety procedures, manufacturer specification details, relevant CEC rules, details of circuit components and setting, testing and checking work done. Explain any choices you have made.

Documentation

Provide details of documentation prepared to support the installation (in accordance with company standards). (1.3)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice prepared to install hydraulic or pneumatic circuit controls including observing the following factors: (1.1)

- ☐ safety procedure
- ☐ access manufacturer operating specifications
- ☐ CEC rules.

Assessor/ verifier name: _____ ***Signature:*** _____ ***Date:*** _____

☐ Apprentice installed control circuits in accordance with industry practice including observing the following factors: (1.2)

- ☐ solenoids
- ☐ PLC operation
- ☐ alternate controls
- ☐ set and adjust operating voltages
- ☐ set and regulate pressures
- ☐ test with overrides or PLC forces
- ☐ check feedback pulses and inputs.

Note: re-installing may be used to assess competency on installing as long as all installation considerations are demonstrated.

Assessor/ verifier name: _____ ***Signature:*** _____ ***Date:*** _____

☐ Installation was documented in accordance with company standards. (1.3)

Assessor/ verifier name: _____ ***Signature:*** _____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name: _____ ***Signature:*** _____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 2: Maintain hydraulic or pneumatic circuit controls on machinery and equipment to CEC rules and manufacturer specifications.

Control Circuit Maintenance

Provide details of the following maintenance activities tests undertaken on the circuits controlling the machinery and explain any choices you have made: (2.1)

Item	Details/reference of maintenance	Date
solenoids		
PLC operation		
alternate controls		
setting and adjustment of operating voltages		

Item	Details/reference of maintenance	Date
setting and regulation of pressures		
testing with overrides or PLC forces		
checking feedback pulses and forces		

Provide details of documentation prepared to backup the maintenance work – in accordance with company standards: (2.2)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Maintained control circuits in accordance with industry practice: (2.1)

- ☐ solenoids were maintained
- ☐ PLC operation checked/adjusted
- ☐ alternate controls were maintained
- ☐ operating voltages were set and adjusted
- ☐ pressures were set and regulated
- ☐ system was tested with overrides or PLC forces
- ☐ feedback pulses and inputs were checked.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Maintenance work was documented in accordance with company standards. (2.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Install and maintain Robotic Control Systems.**

Credit 3

Prerequisite

Competency Standard IE176-4TC, Demonstrate knowledge of the installation and maintenance of Robotic Control Systems.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)

WorkSafeBC Occupational Health and Safety (OHS) regulations.

Definitions

RCS – Robotic Control Systems.

Task 1: **Install robotic and remote control systems to CEC rules and manufacturer specifications.**

Task 2: **Maintain robotic and remote control systems to CEC rules and manufacturer specifications.**

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:
I9 ***Install and maintain Robotic Control Systems***

Task 1: Install robotic and remote control systems to CEC rules and manufacturer specifications.

Outline the following preparation:

- Location of RCS
- Power supply details. (1.1)

Apprentice Diary – Installation (1.2)

Date/s	Describe the robotic installation and the control system and dates of installation. Explain any choices you have made and include: • installation specification • relevant CEC rules • program controller • control features.

Provide details of documentation prepared to support the installation: (1.3)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice prepared for installation of RCS: (1.1)

- ☐ location determined
- ☐ power supply determined.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ RCS was installed to meet design requirements: (1.2)

- ☐ control features met design requirements
- ☐ program controller was installed in accordance with design requirements.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Installation was documented in accordance with company standards. (1.3)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 2: Maintain robotic and remote control systems to CEC rules and manufacturer specifications.

Apprentice Diary – Maintenance (2.1)

Date/s	Description of maintenance undertaken. Explain any choices you have made and include: • troubleshooting techniques • preventative maintenance • maintenance of control systems for operation safety.

Provide details of documentation prepared to support the maintenance activities: (2.2)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice maintained robotic and remote control systems including: (2.1)

- ☐ using troubleshooting techniques
- ☐ carrying out preventative maintenance for micro-electronic controllers
- ☐ maintaining safety control systems.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Maintenance was maintained in accordance with company standards. (2.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Install and maintain direct current (DC) drives in accordance with CEC rules and manufacturer specifications.**

Credit 9

Prerequisite

Competency Standard IE178-4TC, Demonstrate knowledge of variable speed drives (VSD) and starting systems

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)
WorkSafeBC Occupational Health and Safety (OHS) regulations.

Definitions

Task 1: **Install DC drives and associated motor controls to CEC rules.**

Task 2: **Maintain DC drives and associated motor controls to CEC rules.**

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:

J7 ***Install and maintain DC drive systems***

Task 1: Install DC drives and associated motor controls to CEC rules.

Must include digital and may include analogue drives.

Note: re-installation may be used to assess installing competency as long as all installation considerations are demonstrated.

Preparation: provide details of drive, operating environment requirements, specification for planned installation and applicable CEC rules. (1.1)

Apprentice Diary – Installation (1.2)

Date/s	Description of DC drive installation work done and dates. Explain any choices you have made and include details of: • control system operation • environmental operating conditions • tuning and calibration • wiring sizes and techniques • grounding, shielding and bonding • relevant component specifications.

What documentation was prepared to support the installation in accordance with company standards? (1.3)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice prepared for installation of DC drives: (1.1)

- ☐ accessed and interpreted operation and specification manuals - environmental operating conditions are within parameters.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice properly installed and set-up DC drives: (1.2)

- ☐ control system operation was set up
- ☐ environmental operating conditions were within specification
- ☐ installation was tuned and calibrated
- ☐ correct wiring techniques and sizing were used
- ☐ grounding, shielding and bonding were done within specification
- ☐ installation was correct and true in accordance with manuals.

Note: re-installation may be used to assess installing competency as long as all installation considerations are demonstrated.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Installation is documented to company standards (1.3)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 2: Maintain DC drives and associated motor controls to CEC rules.

Must include digital and may include analogue DC drives.

Apprentice Diary – Digital DC drive maintenance (2.1)

Date/s	Description of maintenance work done over a period of time on digital DC drives. Explain any choices made and Include: • troubleshooting techniques • safety procedures • preventative maintenance procedures • interpretation of operation and specification manuals • relevant CEC rules.

Apprentice Diary – Analogue DC drive maintenance (2.1)

Date/s	Description of maintenance work done over a period of time on analogue DC drives (if any – this part may be blank). Explain any choice you have made and include: • troubleshooting techniques • safety procedures • preventative maintenance procedures • interpretation of operation and specification manuals • relevant CEC rules.

What documentation was prepared to support the maintenance in accordance with company standards? (2.2)

Digital:
Analogue (if any):

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ DC drives were properly maintained: (2.1)

- ☐ troubleshooting techniques were used
- ☐ safety procedures were followed
- ☐ preventative maintenance procedures were followed
- ☐ operation and specification manuals were accessed and interpreted.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Maintenance was documented in accordance with company standards (2.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Select power regulation equipment, install and maintain this equipment to applicable code standards and manufacturer guidelines.**

Credit 9

Prerequisite

Competency Standard IE181-4TC, Demonstrate knowledge of backup power equipment, UPS, battery banks and battery charging systems.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)
WorkSafeBC Occupational Health and Safety (OHS) regulations.

Task 1: **Select and install power regulation equipment to CEC rules and equipment manufacturer specifications.**

Task 2: **Maintain power regulation equipment to CEC rules and equipment manufacturer specifications.**

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:

O2 ***Install and maintain power supplies***

Task 1: Select and install power regulation equipment to CEC rules and equipment manufacturer specifications.

Outline the following:

- the installation parameters and specifications that the selection is based on
- the equipment types, uses and load specifications. (1.1)

Apprentice Diary – Installation (1.2)

Date/s	Description/dates of installation and commissioning work done. Explain any choices you have made and include: • details of drawings used • voltage • frequency • alarms • detail of setting of transfer switch parameters.

Documentation

Provide details of documentation done to support the installation. (1.3)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Power regulation equipment was selected in accordance with specification and industry practice: (1.1)

- ☐ equipment types and uses were identified
- ☐ load specifications were determined
- ☐ transfer switch selection is correct.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Power regulation equipment was installed and commissioned in accordance with specifications and industry practice: (1.2)

- ☐ drawings and diagram symbols were correctly interpreted
- ☐ voltage was regulated correctly
- ☐ frequency was regulated correctly
- ☐ alarms were installed/set/commissioned to specification
- ☐ transfer switch was correctly installed to operate within system specification.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Installation was documented in accordance with company standards. (1.3)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 2: Maintain power regulation equipment to CEC rules and equipment manufacturer specifications.

Apprentice Diary – Maintenance **(2.1)**

Date/s	Description/dates of maintenance work done. Explain any choices you have made and include: • preventative maintenance procedures • test of transfer switch • verify component viability • maintenance schedules.

Documentation

Provide details of documentation prepared to support the maintenance. (2.2)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice maintained power regulation equipment in accordance with manufacturer specifications and industry standards. (2.1)

- ☐ preventative maintenance procedures were followed
- ☐ transfer switch was tested
- ☐ component suitability was checked/confirmed or rectified
- ☐ all items identified on maintenance schedules were done.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Maintenance was documented in accordance with company standards (2.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Install and maintain audio and video monitoring systems to monitor processes and security.**

Credit 45

Prerequisite

Competency Standard IE185-4TC, Demonstrate knowledge of safety and security systems.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)

WorkSafeBC Occupational Health and Safety (OHS) regulations.

Task 1: **Install audio and video monitoring systems to display the important functions of machinery to an operator in a control booth.**

Task 2: **Maintain audio and video monitoring systems.**

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:
Q18 ***Install and maintain video monitoring systems***

Task 1: Install audio and video monitoring systems to display the important functions of machinery to an operator in a control booth.

Identify the system that is to be/has been installed. Include relevant system specifications, reference manuals and any relevant CEC rules. (1.1)

Apprentice Diary – Installation (1.2)

Date/s	Describe the monitoring system installation. Explain any choices you have made and include details of: • wiring • shielding and grounding • cable terminations and standardized connections • testing of display • sound and recording media • determination of ambient light match with camera • installation specifications.

Describe the testing and calibration process undertaken. (1.3)

What documentation was prepared to support the installation? (1.4)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Preparation was carried out for installation of a video/audio monitoring system: (1.1)

- ☐ manufacturer installation specifications were accessed/referenced
- ☐ test manuals were accessed/referenced.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ A video/audio monitoring system was installed: (1.2)

- ☐ wiring was carried out correctly
- ☐ shielding and grounding was done
- ☐ cables were terminated and connections standardized
- ☐ display was installed/checked
- ☐ sound and recording media was installed
- ☐ ambient light levels were determined and matched with camera
- ☐ installation specification was referenced during installation.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ System was tested and calibrated in accordance with industry practice. (1.3)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ System installation was documented in accordance with company standards. (1.4)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 2: Maintain audio and video monitoring systems.

Apprentice Diary – Maintenance (2.1)

Date/s	Log the maintenance activities that you have undertaken below. Include the following elements in the log and explain any choices you have made: • troubleshooting techniques • common faults • test equipment • effects of corrosion on signal strength • calibration procedures • analyze noise • ripple • harmonics and inductance • verify shielding integrity • access manufacturer equipment specifications and test manuals • maintenance schedule.

What documentation was prepared to support the maintenance? (2.2)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Audio and video monitoring systems were maintained: (2.1)

- ☐ troubleshooting techniques were used
- ☐ common faults were detected
- ☐ test equipment was used
- ☐ effects of corrosion on signal strength was recognized in maintenance
- ☐ calibration procedures were followed
- ☐ noise was analyzed
- ☐ ripple is analyzed and checked to be within tolerances
- ☐ harmonics and inductance is reviewed and within tolerable levels
- ☐ shielding integrity is verified
- ☐ manufacturer equipment specifications and test manuals were accessed
- ☐ maintenance schedule was followed.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Maintenance was documented in accordance with company standards. (2.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Maintain control systems on common crane types to all applicable codes and standards and in accordance with manufacturer service recommendations.**

Credit 4

Prerequisite

Competency Standard IE188-4TC, Demonstrate knowledge of crane control systems.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)
WorkSafeBC Occupational Health and Safety (OHS) regulations.

Definitions

VFD – variable frequency drive

Task 1: Inspect and repair as necessary the different common crane control systems in use, in accordance with regulatory requirements and manufacturer specifications

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:
Q10 Maintain crane control systems

Task 1: Inspect and repair as necessary the different common crane control systems in use, in accordance with regulatory requirements and manufacturer specifications.

Complete the following table to identify the dates and details of crane control system maintenance.

Component	Notes about maintenance – what was done?	Dates of maintenance
Electric cables and pendants		(1.1)
VFDs and motors		(1.2)
Contactor contacts		(1.3)
Check procedures for contactors, timers, limit switches, wound rotor motors, soft starters and brakes		(1.4)

Component	Notes about maintenance – what was done?	Dates of maintenance
Test/repair limitation devices		(1.5)

What information was recorded or logged in relation to the maintenance – if possible attach a sample page of log book used/records used in accordance with work practice. (1.6)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Common crane control systems were inspected and electric cables and pendants replaced as required. (1.1)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ VFDs and motors were inspected and replaced as necessary. (1.2)

Note: if VFDs are replaced, use Competency standard IE179-4WC, Install and maintain variable frequency drive (VFD), to assess competency in installation and maintenance of these drives. This competency standard covers the process as a step in crane maintenance.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Contactor contacts were inspected and replaced as necessary (1.3)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Procedures were carried out to check the operation of contactors, timers, limit switches, wound rotor motors, soft starters and brakes. (1.4)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Limitation devices were tested and repaired as necessary. (1.5)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Log book and record keeping procedures were carried out correctly. (1.6)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Demonstrate and apply knowledge of boiler furnace system monitors and controls.**

Credit 6

Prerequisite

Competency Standard IE190-4TC, Demonstrate knowledge of boiler and furnace system monitors and controls.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)
WorkSafeBC Occupational Health and Safety (OHS) regulations.

Task 1: **Install boiler and furnace monitors and controls in accordance with CEC rules and industry practice.**

Task 2: **Maintain boiler and furnace controls.**

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:

Q11 ***Install and maintain boiler furnace system monitors and controls***

Task 1: Install boiler and furnace monitors and controls in accordance with CEC rules and industry practice.

Preparation

Outline the key parameters of the planned boiler and control installation. Include reference to specification and schematic drawings used etc – attach copies of documentation if preferred. (1.1)

Apprentice Diary – Installation (1.2)

Date/s	Complete the diary to identify the details and dates of the monitor and control installation. Explain any choices you have made and include the following: • safety procedures • controller regulation • controller logic • monitoring • safety mechanisms • start up and shut down cycles • emergency damping controllers and sensors. *Note: re-installation may be used as long as all the above required aspects are demonstrated.*

Identify and describe (or attach samples of) the documentation completed to support the above identified installation: (1.3)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Preparation was carried out prior to the installation of boiler and furnace controls: (1.1)

- ☐ installation schedule was prepared
- ☐ manufacturer specifications and installation schematics were accessed and interpreted.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Boiler and furnace controls were installed, tested and commissioned in accordance with manufacturer specifications: (1.2)

- ☐ safety procedures were followed
- ☐ controller regulation was carried out
- ☐ controller logic was set
- ☐ monitoring system was installed
- ☐ safety mechanisms were installed
- ☐ start up and shut down cycles were set up and tested
- ☐ emergency damping controllers and sensors were set up.

Note: re-installation may be used as long as all the above required aspects are demonstrated.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Installation was documented in accordance with company standards. (1.3)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 2: Maintain boiler and furnace controls

Controller and monitor maintenance (2.1)

Maintenance must include the following, please supply brief details of each by filling in the right hand column:

Info	Details
maintenance schedule	
Manufacturer maintenance instructions	
test schedule	
test points	
safety procedures	

Complete the following table to record the maintenance activities that must be undertaken for this competency standard: (2.1)

Maintenance area	Description of work/related work	Dates
Controller regulation		
Controller logic check/set		
Access manufacturer specs/schematics		
Maintain monitoring system		

Maintenance area	Description of work/related work	Dates
Maintain safety mechanisms		
Maintain/check start up/shut down cycles		
Maintain emergency damping controllers and sensors		

Documentation of maintenance

Identify and describe (or attach samples of) the documentation completed to support the maintenance activities: (2.2)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Maintenance included: (2.1)

- ☐ maintenance according to schedule
- ☐ maintenance in accordance with manufacturer maintenance instructions
- ☐ testing in accordance with a schedule
- ☐ test points
- ☐ safety procedures.

☐ Boiler and furnace controls were maintained in accordance with industry requirements: (2.1)

- ☐ controller regulation maintenance was carried out
- ☐ controller logic maintenance was carried out
- ☐ manufacturer schematics were accessed and interpreted
- ☐ maintenance of monitoring system carried out
- ☐ safety mechanisms were maintained
- ☐ start up and shut down cycles were checked/maintained
- ☐ operation of emergency damping controllers and sensors was checked/maintained.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Maintenance work was documented in accordance with company standards (2.2)

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Install and maintain DC motors to CEC rules and manufacturer specifications.**

Credit 9

Prerequisite

Competency Standard IE192-3TC, Demonstrate knowledge of DC motors.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)

WorkSafeBC Occupational Health and Safety (OHS) regulations.

Other useful references

Rosenberg's motor theory manual

Electrical Apparatus Service Association (EASA) Electrical Engineering Pocket Handbook

American Electrician Motor Handbook (Electrician)

Ugly's electrical references.

Task 1: **Install DC motors to applicable regulatory code standards and equipment manufacturer specifications.**

Task 2: **Maintain and troubleshoot DC motors to ensure reliability and longevity of the drive.**

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:

L5 ***Install and maintain DC electric motors***

Task 1: Install DC motors to applicable regulatory code standards and equipment manufacturer specifications.

Preparation

Outline the preparation activities undertaken prior to installation. Include: (1.1)

- Preparation work done that relates to the motor and installation specification – include overview information about the motor and installation.
- Work done that relates to communication of the installation to others and ensuring that the planned installation complies with workplace procedures.

Apprentice Diary – Installation (1.2)

Date/s	Provide details of the installation activities and dates. Explain any choices you have made and include: • wiring techniques and sizing • details of grounding, shielding and bonding • fuses and overload protection • brush characteristics • seating and positioning details • motor and wiring protection detail • field coil and armature checks and tests carried out • current check • rotation check. *Note: re-installation may be used if installation is not practical.*

What documentation has been prepared to support the installation (in accordance with company standards)? (1.3)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Preparation was carried out for installation and set-up of DC motors: (1.1)

- ☐ relevant information about the installation was communicated to others prior to installation
- ☐ hand off procedures were followed
- ☐ operation and specification manuals were accessed/interpreted in preparation for the installation
- ☐ installation blueprints were accessed/interpreted prior to installation
- ☐ motor name plate information was accessed.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ DC motors were set-up and installed in accordance with CEC rules: (1.2)

- ☐ motor information was accessed
- ☐ wiring and wire sizing techniques were followed correctly
- ☐ grounding, shielding and bonding was carried out correctly
- ☐ fuses and overload protection were installed
- ☐ brush seating and positioning was correct
- ☐ motor and wiring was physically protected
- ☐ field coil and armature checks and tests were done
- ☐ current was checked
- ☐ rotation was checked.

Note: re-installation may be used to assess competency on installing as long as all the required installation aspects are demonstrated.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Installation was documented in accordance with company standards. (1.3)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 2: Maintain and troubleshoot DC motors to ensure reliability and longevity of the drive.

Preparation

Outline the job and parameters of the maintenance activities carried out. Include details of reference manuals and specifications and previous maintenance records: (2.1)

Apprentice Diary –Maintenance (2.2)

Date/s	Identify the maintenance work carried out and dates. Include the following and explain any choices you have made: • safety procedures • troubleshooting techniques • preventative maintenance procedures • commutator maintenance • brush maintenance • lubrication schedule • cleaning *Note: May also include neutral plane analysis, vibration analysis, cooling fins, fans and filters.*

Maintenance documentation

Identify the documentation prepared to support the maintenance work in accordance with company standards: (2.3)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Preparation for maintenance of DC motors was carried out: (2.1)

- ☐ operation and specification manuals were accessed and interpreted
- ☐ maintenance records were referred to.

Assessor/ verifier name: _____ ***Signature:*** _____ ***Date:*** _____

☐ DC motors were maintained in accordance with manufacturer specifications: (2.2)

- ☐ safety procedures were followed
- ☐ troubleshooting techniques were used
- ☐ preventative maintenance procedures were followed
- ☐ commutator maintenance was carried out
- ☐ brushes were maintained
- ☐ lubrication schedule was followed
- ☐ parts were cleaned during maintenance.

May include (tick those relevant):

- ☐ neutral plane analysis
- ☐ vibration analysis
- ☐ cooling fins, fans and filters.

Assessor/ verifier name: _____ ***Signature:*** _____ ***Date:*** _____

☐ Maintenance was documented in accordance with company standards. (2.3)

Assessor/ verifier name: _____ ***Signature:*** _____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name: _____ ***Signature:*** _____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Maintain and operate electronic precipitators.**

Credit **5**

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)

WorkSafeBC Occupational Health and Safety (OHS) regulations.

Task 1: **Maintain electronic precipitators in accordance with CEC rules and manufacturer specifications.**

Task 2: **Operate electronic precipitators in accordance with company standards and manufacturer specifications.**

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:

I8 ***Maintain electronic precipitators***

Task 1: Maintain electronic precipitators in accordance with CEC rules and manufacturer specifications.

Apprentice Diary – Maintenance (1.1)

Date/s	Describe the precipitator maintenance work carried out and the dates in the apprentice diary below. Explain any choices you have made and include maintenance of: • electrodes • flushing • power controls • clearances • operation of safety lockouts.

Describe the documentation completed to support the maintenance in accordance with company standards. (1.2)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Electronic precipitators were maintained: (1.1)

- ☐ electrodes were maintained
- ☐ flushing was carried out
- ☐ power controls were checked/maintained
- ☐ clearances were checked/maintained accordingly
- ☐ operation of safety lockouts was checked/maintained accordingly.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Maintenance was documented accordingly. (1.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 2: Operate electronic precipitators in accordance with company standards and manufacturer specifications.

Apprentice Diary – Operation (2.1)

Date/s	Outline your use/operation/adjustment/setup of electrical precipitators. Explain any choices you have made and include: • control parameter adjustments • flushing.

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Electronic precipitators were operated in accordance with company standards and equipment specifications: (2.1)

- ☐ control parameter adjustments were made correctly
- ☐ flushing was carried out.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Safely use powder operated tools.**

Credit 1

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, the Canadian Electrical Code, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard is required to demonstrate proof of training in powder actuated tools in accordance with WorkSafeBC Occupational Health and Safety regulations.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)

WorkSafeBC OHS regulations.

Task 1: Demonstrate safe and proper use of powder actuated tools.

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:
C4 Use powder actuated tools

Task 1: Demonstrate safe and proper use of powder actuated tools.

Describe a powder operated tool that you have used for this assessment event: (1.1)

List, describe, sketch or attach a copy of the relevant manufacturer operation instructions for this tool. Include assembly steps and maintenance. (1.2)

Identify the personal safety protection equipment required when operating this tool. (1.3)

Describe the range of powder load options that may be used in the tool. 1.4)

Describe the range of fastener options that may be used in the tool. (1.4)

Identify load/fastener combinations that you have used and describe the practical application of combinations to 3 different situations (and the dates used). (1.5)

Describe the handling and storage precautions that must be followed for the tool and powder load.(1.6)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Demonstrated knowledge of manufacturer procedures for the tool used for the assessment. (1.1)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Assembled and maintained the tool used for the assessment. (1.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Identified and used the correct personal protection equipment. (1.3)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Explained load and fastener selection options and the application of combinations to 3 different situations. (1.4)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Selected load and fasteners. (1.5)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Explained safe handling and storage techniques and safely handled and stored the tools. (1.6)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Describe and correctly use personnel lifting devices.**

Credit 1

Prerequisite

Class 1 or 2 Boom Truck Operator certification must be obtained before practical training; and Class 2 certification before assessment in the use of a boom truck, in accordance with WorkSafeBC Occupational Health and Safety (OHS) regulations.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must hold Class 3 Boom Truck Operator certification in accordance with WorkSafeBC OHS regulations.

References

WorkSafeBC Occupational Health and Safety (OHS) Regulations.

Task 1: **Describe and demonstrate proper and safe procedures for use of a boom truck personnel lifting device according to manufacturer specifications and company standards.**

Task 2: **Describe and demonstrate proper and safe procedures for use of other personnel lifting devices according to manufacturer specifications and company standards.**

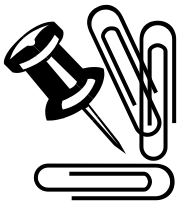
This unit relates to the following competency number and topic in the provincial OAC and Program Outline:

C9 ***Operate personnel lifting devices***

Task 1: Describe and demonstrate proper and safe procedures for use of a boom truck personnel lifting device according to manufacturer specifications and company standards.

Theory

Attach the WorkSafeBC Class 2 Boom Truck Operator theory examination certificate. (1.1)



Practical use of an empty platform boom truck lifting device (1.2)

You must have obtained certification for the Class 2 Boom Truck Operator exam prior to using the device

Apprentice Diary **(1.2)**

Date/s	Describe the lifting device details and operation dates for an empty platform, include safety precautions, load limits for the device etc.

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice correctly completed Class 2 Boom Truck Operator theory examination. (1.1)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice safely used a boom truck personnel lifting device, with an empty personnel platform. (1.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 2: Describe and demonstrate proper and safe procedures for use of other personnel lifting devices according to manufacturer specifications and company standards.

Task 2 relates to non-truck mounted telescopic boom lifts and scissor lifts.
Complete the following information for the scissor and telescopic boom lifts that you are using for this assessment.

Briefly describe the scissor lift and telescopic boom lift: (2.1)

In the table below describe the safety procedures and regulations relevant to each piece of equipment: (2.1)

Safety consideration	Telescopic boom lift	Scissor lift
loading capacity and detail		
inspection and testing frequency/detail		
backup controls detail		
fall arrest equipment detail		

Safety consideration	Telescopic boom lift	Scissor lift
other safety regulations		

Apprentice Diary (2.2)

Date/s	Describe the jobs where you used the lifting devices identified above and the dates

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

Competence must be demonstrated in both:

- ☐ scissor lift
- ☐ telescopic boom.
- ☐ Apprentice described safety procedures and regulations for the safe use of scissor and telescopic personnel lifting devices: (2.1)
  - ☐ safe loading operating limits and precautions were described
  - ☐ loading capacity was identified
  - ☐ inspection and testing procedures were described
  - ☐ backup controls were described
  - ☐ fall arrest equipment was described
  - ☐ operating safety regulations were described.

  Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

- ☐ Apprentice operated the scissor and articulating personnel lifting devices correctly and safely. (2.2)

  Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

- ☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

  Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Safely and properly use liquid-fuel powered tools**

Credit 1

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Note :Proper use includes safe working conditions - such things as sources of ignition, environmental factors etc.

Quality Assurance

Any assessor assessing against this competency standard is required to demonstrate proof of training in liquid-fuel powered tools in accordance with WorkSafeBC Occupational Health and Safety regulations.

Task 1: Demonstrate proper and safe application and handling of liquid-fuel powered tools used by electricians to industry and company standards.

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:
C7 Use liquid-fuel powered tools

Task 1: Demonstrate proper and safe application and handling of liquid-fuel powered tools used by electricians to industry and company standards.

This task must be done on a 2 cycle powered tool and a 4 cycle powered tool. One of the tools identified below must be a chainsaw, cut-off saw, generator, string trimmer or power washer.

Note: company specific standards must be observed during assessment.

Apprentice Diary – 2 cycle powered tool (1.1 – 1.2)

Date/s	Describe your use of a 2 cycle powered tool. Include: • tool type • safety precautions/guard setup • personal protection equipment • blade types • details of fuel handling, mixing and storage • details of job • dates work completed • tool operation maintenance (clean up and lubrication – not repair or service).

Apprentice Diary – 4 cycle powered tool (1.1 – 1.2)

Date/s	Describe your use of a 4 cycle powered tool. Include: • tool type • safety precautions/guard setup • personal protection equipment • blade types • details of fuel handling and mixing • details of job • dates work completed • tool operation maintenance (clean up and lubrication – not repair or service).

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice selected and properly used liquid-fuel powered tools. (1.1)

- ☐ Both 2 cycle and 4 cycle powered tools were used
- ☐ Included one of the following:
  - chainsaw
  - cut-off saw
  - generator
  - string trimmer
  - power washer

- ☐ working conditions were safe
- ☐ personal protection equipment was worn
- ☐ any blades/cutting attachments were suitable for the job
- ☐ guards were used properly
- ☐ fuel was safely handled – including mixing (2 cycle) and storing

- ☐ company specific standards were observed during assessment.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Liquid powered tools were maintained properly. (1.2)

Note: maintain is to leave the tool in good working order but not to perform repair and refurbishment of the tool.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Demonstrate knowledge of operation and install and maintain wound rotor drives to CEC rules and to manufacturer specifications.**

Credit 7

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)

WorkSafeBC Occupational Health and Safety (OHS) regulations

Other useful references

Rosenberg's motor theory manual

Electrical Apparatus Service Association (EASA) Electrical Engineering Pocket Handbook

American Electrician Motor Handbook (Electrician)

Ugly's electrical references.

Task 1: **Demonstrate knowledge of the operation of a wound rotor drive to CEC rules and manufacturer specifications.**

Task 2: **Install a wound rotor drive to CEC rules and manufacturer specifications.**

Task 3: **Maintain and troubleshoot wound rotor drives to ensure reliability and longevity of the drive.**

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:
J8 ***Install and maintain wound rotor drives***

Task 1: Demonstrate knowledge of the operation of a wound rotor drive to CEC rules and manufacturer specifications.

Identify 2 vendor supplied would rotor drive systems and describe their purpose, potential applications and control system types (1.1)

- Describe the systems' compatibility with other drive types
- Discuss the advantages of a wound rotor drive system compared to any other alternatives.

Note: add extra paper if required

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice demonstrated knowledge of the operation of wound rotor drives: (1.1)

- ☐ demonstrated knowledge of vendor systems and compatibility with other drive types
- ☐ demonstrated knowledge of control system types
- ☐ demonstrated knowledge of wound rotor drive applications.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 2: Install a wound rotor drive to CEC rules and manufacturer specifications.

Note: *re-installing may be used to assess competency on installing as long as all installation considerations are demonstrated.*

Installation preparation (2.1)

Select a wound rotor drive installation that you have completed to use as an assessment event.

Describe:

- the installation specification
- manufacturer/vendor and reference manuals used prior to and during the installation
- safety procedures that apply to the installation.

Apprentice Diary – Wound rotor drive installation (2.2)

Date/s	Describe the installation and dates of installation. Explain any choices you have made and include: • safety procedures followed • wiring techniques used and sizing details • grounding, shielding and bonding details.

What documentation was prepared to support the installation – in accordance with company requirements? (2.3)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice prepared for installation of wound rotor drives: (2.1)

- ☐ apprentice followed safety procedures
- ☐ apprentice accessed and interpreted operation and specification manuals.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice installed (or re-installed) and setup a wound rotor drive: (2.2)

- ☐ apprentice followed safety procedures
- ☐ apprentice used correct wiring techniques and sized wiring correctly
- ☐ apprentice correctly installed grounding, shielding and bonding for the installation.

Note: re-installing may be used to assess competency on installing as long as all installation considerations are demonstrated.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice documented the installation to company standards. (2.3)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 3: Maintain and troubleshoot wound rotor drives to ensure reliability and longevity of the drive.

Apprentice Diary – Wound motor drive maintenance and troubleshooting (3.1)

Date/s	Describe the maintenance and troubleshooting activities and dates. Explain any choices you have made. Examples of information to include are: • safety procedures followed • access and interpretation of operation manuals • troubleshooting techniques used • preventative maintenance procedures followed.

What documentation was prepared to support the maintenance in accordance with company requirements? (3.2)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Wound rotor drive was maintained to CEC rules and manufacturer requirement. (3.1)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Maintenance was documented in accordance in accordance with company standards. (3.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:***_____

Assessor Signature: _____ ***Date:***_____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Install and maintain wireless controllers to applicable standards and manufacturer specifications.**

Credit 4

Prerequisite

Competency Standard IE176-4TC, Demonstrate knowledge of the installation and maintenance of Robotic Control Systems.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)

WorkSafeBC Occupational Health and Safety (OHS) regulations

Industry Canada Spectrum Regulations.

Task 1: **Install wireless controller systems in accordance with regulations and manufacturer specifications.**

Task 2: **Maintain wireless controller systems in accordance with regulations and manufacturer specifications.**

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:
Q12 ***Install and maintain wireless radio controllers***

Task 1: Install wireless controller systems in accordance with regulations and manufacturer specifications.

Describe the specification of the selected wireless radio control system to be installed. (1.1)
Include:

- equipment manufacturer equipment references (specifications/installation manuals)
- spectrum details and compliance
- any other potentially relevant preliminary information relating to the installation of the system.

Apprentice Diary – Wireless controller installation (1.1)

Date/s	Provide dates and work details for the installation. Explain any choices you have made and include: • set-up and reception verification details • shielding and interference details • wiring and bonding details.

What documentation was prepared to support this installation? (in accordance with company standards) (1.2)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice installed wireless controller systems in accordance with manufacturer manuals and spectrum management guidelines: (1.1)

- ☐ set-up and reception verification were carried out
- ☐ shielding and interference minimization was done
- ☐ wiring and bonding was carried out correctly.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice documented installation in accordance with company standards. (1.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 2: Maintain wireless controller systems in accordance with regulations and manufacturer specifications.

Apprentice Diary – Maintenance (2.1)

Date/s	Describe the maintenance activities carried out and dates. Explain any choices you have made and include reference to: • spectrum management guidelines • reception verification • shielding and interference • wiring and bonding • service specification/maintenance schedules.

Provide details of the documentation completed to support the maintenance. (2.2)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Wireless controllers were maintained in accordance with manufacturer service specifications and spectrum management guidelines: (2.1)

- ☐ reception was verified
- ☐ shielding and interference was checked/confirmed/repaired as required
- ☐ wiring and bonding was checked/confirmed/repaired as required
- ☐ maintenance schedules were followed.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Maintenance work was documented in accordance with company standards. (2.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Maintain portable switch houses and ensure readiness for use.**

Credit 4

Prerequisite

Competency Standard IE153-9WA, Install and maintain high voltage circuits.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)
WorkSafeBC Occupational Health and Safety (OHS) regulations.

Sector References

Mines Act [RSBC 1996] CHAPTER 293

CAN/CSA-M421-00 (R2005) - Use of electricity in mines.

Definitions

PM routine – Preventative Maintenance Routine.
OCB – Oiled Circuit Breakers.
Regulatory codes – all Acts, Regulations and standards in force including those in references above.

Task 1: **Demonstrate knowledge of portable switch houses.**

Task 2: **Maintain portable switch houses so that they are ready for use and reliable in the field.**

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:
N5 ***Maintain portable switch houses***

Task 1: Demonstrate knowledge of portable switch houses.

Describe the following portable switch house elements and how those elements relate to the of the switch house – add extra paper if required: (1.1)

Switch house element	Description related to the switch house construction
Identify high voltage system types that may utilize a portable switch house	
Typical range of power/load power	
Describe the transformer construction/features	
Describe the construction of the OCB and features	
Describe the construction of breakers and cables within the switch house	
Describe the bus	
Describe the pilot circuits	

Draw a schematic sketch of the arrangement of components of a portable switch house below to illustrate the general operation: (1.1, 1.2)

Explain one or more typical switch house application/s and the operation of the switch house within the application: (1.2)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice has described portable switch house components and construction: (1.1)

- ☐ high voltage system was described
- ☐ main power/load power details were described
- ☐ transformer was described
- ☐ OCBs were described
- ☐ breakers and cables were described
- ☐ bus was described
- ☐ pilot circuits were described.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice explained portable switch house operation and applications in terms of purpose. (1.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 2: Maintain portable switch houses so that they are ready for use and reliable in the field.

Apprentice Diary – Maintenance (2.1)

Date/s	Identify the maintenance activities carried out on switch houses and dates completed. Explain any choices you have made.

Expand on/describe how the following aspects of portable switching houses were included in the maintenance activities. (2.1)

Maintenance aspect	Description of relevant work
high voltage safety	
danger points in switch houses	
load target and incoming supply	
protection and control circuits	
bus work	
integrity of insulation	
relay calibration	

Maintenance aspect	Description of relevant work
stand-off insulators tests	
ground fault testing	
ground monitoring circuit testing	

Describe the PM routine and identify amendments that you have made to that routine and the dates of amendments and reasons for amendment – attach workplace PM routine documentation or provide details of the documentation. (2.2)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice maintained portable switch house houses in accordance with regulatory codes and industry practice: (2.1)

- ☐ high voltage safety precautions were followed correctly
- ☐ danger points in switch house were identified/checked/maintained as necessary
- ☐ load targets and incoming supply was checked/maintained as required
- ☐ protection and control circuits were checked/maintained as required
- ☐ bus work was carried out
- ☐ integrity of insulation was checked/maintained as required
- ☐ relay calibration work was carried out
- ☐ standoff insulator tests were carried out
- ☐ ground fault testing was carried out
- ☐ ground monitoring circuit testing was carried out.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ PM routine was described and amended. (2.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Demonstrate knowledge of safe line maintenance repair and installation procedures, including applicable installation codes and safety standards.**

Credit 3

Prerequisite

Competency Standard IE152-4TC, Demonstrate knowledge of the installation and maintenance of high voltage circuits

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)

WorkSafeBC Occupational Health and Safety (OHS) regulations.

Sector References

Mines Act [RSBC 1996] CHAPTER 293

CAN/CSA-M421-00 (R2005) - Use of electricity in mines

Definitions

Regulatory codes – all Acts, Regulations and standards in force including those in references above.

Task 1: **Demonstrate knowledge of safe line installation procedures including applicable installation codes and safety standards.**

Task 2: **Demonstrate knowledge of safe line maintenance and repair procedures including applicable installation codes and safety standards.**

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:

N6 ***Demonstrate knowledge of line installation, maintenance, and repair procedures***

Task 1: Demonstrate knowledge of safe line installation procedures including applicable installation codes and safety standards.

Complete the matrix table below to describe line installation procedures and identify the relevant codes. (1.1)

Installation procedure	Description of procedure	Relevant regulatory codes
grounding		
isolation		
hoist safety		
harnessing and restraints		
installing lines		
installing pole transformers		

Installation procedure	Description of procedure	Relevant regulatory codes
installing shunts		
installing towers and pole		
other (if identified)		
other (if identified)		

Complete the table below to describe the equipment used and safety procedures followed during line installation. (1.2)

Equipment	Description of equipment	Safety procedures/codes followed
line trucks		
scissor lifts		
pole climbing equipment		
high voltage safety gear		
protective clothing		

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

Installation knowledge

☐ Apprentice demonstrated knowledge of line installation procedures in accordance with industry practice and regulatory codes: (1.1)

- ☐ knowledge of grounding procedures was demonstrated
- ☐ knowledge of isolation procedures was demonstrated
- ☐ knowledge of hoist safety was demonstrated
- ☐ knowledge of harnessing and restraints was demonstrated
- ☐ knowledge of line installation was demonstrated
- ☐ knowledge of pole transformer installation was demonstrated
- ☐ knowledge of shunt installation was demonstrated
- ☐ knowledge of tower and pole installation was demonstrated.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice described line installation equipment and safety requirements: (1.2)

- ☐ line truck use and safety requirements were described
- ☐ scissor lift use and safety requirements were described
- ☐ pole climbing equipment and safe use was described
- ☐ high voltage safety gear was described
- ☐ protective clothing was described.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 2: Demonstrate knowledge of safe line maintenance and repair procedures including applicable installation codes and safety standards.

Complete the matrix table below to show your knowledge of line maintenance and repair procedures. (2.1)

Maintenance item	Maintenance and repair procedures	Applicable codes
grounding		
isolation		
hoist safety		
harnessing and restraints		
lines pole transformers shunts		
towers and poles		

Describe the requirements of line maintenance equipment by completing the following table. (2.2)

Equipment	Describe the use of the equipment during line maintenance
line trucks	
scissor lifts	
pole climbing equipment	
high voltage safety gear	
protective clothing	

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

Line maintenance knowledge

☐ Apprentice demonstrated knowledge of line maintenance and repair procedures in accordance with industry practice and regulatory codes: (2.1)

- ☐ knowledge of maintenance of line grounding was demonstrated
- ☐ knowledge of maintenance of line wiring isolation systems was demonstrated
- ☐ knowledge of hoist safety during line maintenance was demonstrated
- ☐ knowledge of harnessing and restraints during line maintenance was demonstrated
- ☐ knowledge of line maintenance was demonstrated
- ☐ knowledge of pole transformer maintenance was demonstrated
- ☐ knowledge of shunt maintenance was demonstrated
- ☐ knowledge of towers and pole maintenance was demonstrated.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice described the requirements of line maintenance equipment – during maintenance: (2.2)

- ☐ requirements of line trucks was described
- ☐ requirements of scissor lifts was described
- ☐ requirements of pole climbing equipment was described
- ☐ requirements of high voltage safety gear was described
- ☐ requirements of protective clothing were described.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Install and maintain wheel motors to manufacturer specifications and service standards.**

Credit 9

Prerequisite

Competency Standard IE193-9WA, Install and maintain DC electric motors

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)
WorkSafeBC Occupational Health and Safety (OHS) regulations.

Sector References

Mines Act [RSBC 1996] CHAPTER 293
CAN/CSA-M421-00 (R2005) - Use of electricity in mines.

Definitions

PM routine – Preventative Maintenance Routine.
OCB – Oiled Circuit Breakers.
Regulatory codes – all Acts, Regulations and standards in force including those in references above.

Task 1: **Demonstrate knowledge of wheel motors and wheel motor operation.**

Task 2: **Install wheel motors in the field to manufacturer service standards and specifications.**

Task 3: **Maintain wheel motors in the field to manufacturer service standards and specifications.**

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:
L6 ***Install and maintain wheel motors***

Demonstrating knowledge

Task 1: Demonstrate knowledge of wheel motors and wheel motor operation.

Describe wheel motors and wheel motor operation by completing the following table: (1.1)

Component	• notes about typical component specification • specific application of component to wheel motor installations.
AC motors	
DC motors	
variable speed control systems	
electrical components	
mechanical components	
safety features.	

Sketch a schematic drawing of the electrical component hook up for a wheel motor application of your choice (AC or DC) – identify the application. (1.1)

Outline 3 different wheel motor applications – include the motor type and approx power and control system for each type. (1.2)

Application	Details
1.	
2.	
3.	

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice described wheel motors and wheel motor operation: (1.1)

- ☐ AC motor operation was described
- ☐ DC motor was described
- ☐ variable speed control systems were described
- ☐ electrical system components were described
- ☐ mechanical components were described
- ☐ safety features were described.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice outlined wheel motor applications. (1.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Task 2: Install wheel motors in the field to manufacturer service standards and specifications.

The installation section requires that you record at least 2 installations – one with an AC motor and 1 with a DC motor. Make sure these installations include a variable speed controller, a speed sensor and a resistance temperature device. They can be in one or both – or more than two installations may be needed to cover these components.

AC motor installation (2.1)

Describe the AC motor installation. Include the main features and details of the specification used.

Apprentice Diary – AC installation (2.1)

Date/s	AC motor installation – describe details and dates of installation. Explain any choices you have made.

DC motor installation (2.1)

Describe the DC motor installation. Include the main features and details of the specification used.

Apprentice Diary – DC installation (2.1)

Date/s	DC motor installation – describe installation dates and related information. Explain any choices you have made.

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice installed wheel motors in accordance with industry practice and regulatory codes: (2.1)

- ☐ AC motor wheel motors were installed
- ☐ DC motor wheel motors were installed
- ☐ Variable speed control systems were installed
- ☐ Installation record database was kept
- ☐ speed sensors were installed
- ☐ resistance temperature device (RTD)
- ☐ manufacturer service manual was accessed
- ☐ the installation was done in accordance with the specifications.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 3: Maintain wheel motors in the field to manufacturer service standards and specifications.

Maintenance

The following elements of wheel motor systems must be maintained. Identify the dates and details of these maintenance events. (3.1)

Item to be maintained	Details of maintenance work completed	Dates completed
brush spring tension		
torque connection		
shunts		
lugs		
analyze brush wear patterns and commutator marking		

Item to be maintained	Details of maintenance work completed	Dates completed
cables and shielding		
maintenance records database		
access to manufacturer maintenance records		
maintenance schedules		
manufacturer service standards and specifications		
safety.		

Provide details of the documentation completed to support the maintenance (3.2)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice maintained wheel motors in accordance with industry practice and regulatory codes. (3.1)
The following were maintained/serviced etc:

- ☐ brush spring tension
- ☐ torque connection
- ☐ shunts
- ☐ lugs
- ☐ analysis of brush wear patterns and commutator marking
- ☐ cables and shielding
- ☐ maintenance records database accessed
- ☐ manufacturer maintenance records accessed
- ☐ maintenance schedules followed
- ☐ maintenance carried out in accordance with manufacturer service standards/specifications
- ☐ safety precautions followed.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice documented maintenance to company standards. (3.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Make up and repair trailing able to withstand field use in accordance with regulations and codes.**

Credit 3

Prerequisite

Competency Standard IE153-9WA, Install and maintain high voltage circuits

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)

WorkSafeBC Occupational Health and Safety (OHS) regulations.

Sector References

Mines Act [RSBC 1996] CHAPTER 293
CAN/CSA-M421-00 (R2005) - Use of electricity in mines.

Definitions

PM routine – Preventative Maintenance Routine
OCB – Oiled Circuit Breakers
Regulatory codes – all Acts, Regulations and standards in force including those in references above.

Task 1: **Demonstrate knowledge of trailing power cables.**

Task 2: **Make-up trailing power cable to meet regulatory codes and the rigours of field use in accordance with industry practice.**

Task 3: **Repair trailing power cable to meet regulatory codes and the rigours of field use in accordance with industry practice.**

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:
N7 ***Make-up and repair trailing cable (4160 – 13.8kV and 2300 – 600V)***

Task 1: Demonstrate knowledge of trailing power cables.

Identify 3 applications of trailing power cable. (1.1)

1

2

3

Demonstrate you knowledge of trailing power cables by completing the table below to specifically describe the applications:

Application 1

Criteria	Details for application 1
standards that apply	
insulation requirements	
armoured jacket details	
flexibility requirements	
temperature range	
load requirement	

Application 2

Criteria	Details for application 2
standards that apply	
insulation requirements	
armoured jacket details	
flexibility requirements	
temperature range	
load requirement	

Application 3

Criteria	Details for application 3
standards that apply	
insulation requirements	
armoured jacket details	
flexibility requirements	
temperature range	
load requirement	

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Trailing power cable was described by apprentice in terms of applications and the requirements to meet regulatory standards and the rigours of field use: (1.1)

- ☐ relevant standards were identified
- ☐ insulation requirements were described
- ☐ armoured jackets were described
- ☐ cable flexibility was described
- ☐ temperature factors were described
- ☐ load requirements were described.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 2: Make-up trailing power cable to meet regulatory codes and the rigours of field use in accordance with industry practice.

In this section you must provide details of making up of cables.

Apprentice Diary – Making up trailing power cable (2.1)

Date/s	Describe a case study cable that you have made up to be used as an assessment event for this task and the dates. Explain any choices you have made.

Provide the following information relating to making up of a cable and dates that each of the elements was completed. This may relate to the case study event above or if not included in the case study must be from another job that you have completed: (2.1)

Element of making up of cable	Details	Dates/job on which this was done
bench tools used and what they were used for		
field tools used and what they were used for		

repair techniques used (and or what job)		
winding and rotation details		
weather seals and waterproofing		
chafe guards and kink protection.		

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice made up trailing power cables in accordance with CEC rules: (2.1)

- ☐ bench tools were used appropriately
- ☐ field tools were used appropriately
- ☐ winding and rotation of cables was done correctly
- ☐ weather seals and waterproofing was applied correctly
- ☐ chafe guards and kink protection was applied correctly.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 3: Repair trailing power cable to meet regulatory codes and the rigours of field use in accordance with industry practice.

Apprentice Diary – Cable repair (3.1)

Date/s	Outline the details of a trailing cable repair job that you have undertaken. Explain any choices you have made and include the dates of work and the CEC rules that apply.

Provide the following details about specific elements of the repair. (3.1)

Element	Details
bench tools used	
field tools used	
repair techniques	
winding and rotation	
weather seals and waterproofing	
chafe guards and kink protection.	

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice repaired trailing power cables in accordance with CEC rules: (3.1)

- ☐ bench tools were used appropriately
- ☐ field tools were used appropriately
- ☐ repair techniques were appropriate
- ☐ winding and rotation of cables was done correctly – where required
- ☐ weather seals and waterproofing was applied correctly – where required
- ☐ chafe guards and kink protection was applied correctly – where required.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Demonstrate and apply knowledge of the installation and maintenance of Global Positioning Receivers and antennae.**

Credit 3

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)
WorkSafeBC Occupational Health and Safety (OHS) regulations.

Sector references

Mines Act [RSBC 1996] CHAPTER 293
CAN/CSA-M421-00 (R2005) - Use of electricity in mines

Definitions

DGPS – Differential GPS
GPS – Global Positioning System
WAAS – Wide Area Augmentation System
Regulatory codes – all Acts, Regulations and standards in force including those in references above.

Task 1: **Demonstrate knowledge of GPS operation, applications, installation, and maintenance.**

Task 2: **Install and commission GPS receivers, displays, and antennas.**

Task 3: **Maintain GPS receivers, displays, and antennas.**

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:
Q13 ***Install and maintain a Global Positioning System (GPS)***

Task 1: Demonstrate knowledge of GPS operation, applications, installation, and maintenance.

Draw below a sketch that indicates the operation of a GPS system. Include:

- receiver
- display
- power supply
- satellite
- data transmission
- ground based error correction
- WAAS/DGPS.

Describe the following GPS components/features (1.1)

Component/feature	Description
antenna	
receiver	
display	
power supply	
satellite visibility	
limitations	
standards of accuracy	
data transmission	
ground based error correction	
WAAS and DGPS	
shielding and bonding	
location and environmental factors	

Identify and describe 3 industrial applications of GPS (1.2)

Application	Description
1	
2	
3	

Explain the following set-up considerations by completing the table below: (1.3)

Set-up consideration	Explanation of set-up considerations/requirements/procedure
satellite visibility	
standard of accuracy	
data transmission considerations	
ground based error correction factors	
DGPS and WAAS	
codes	

What maintenance considerations/requirements are there for GPS setups?
Refer to manufacturer installation and operational instructions for maintenance recommendations.(1.4)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice described GPS networks, components and operation (1.1)

- ☐ antennas were described
- ☐ receiver was described
- ☐ display was described
- ☐ power supply factors were described
- ☐ satellite visibility factors were described
- ☐ limitations of GPS set-ups were described
- ☐ standards of accuracy were described
- ☐ data transmission paths were described
- ☐ ground based error correction systems were described
- ☐ WAAS and DGPS were described
- ☐ shielding and bonding factors were described
- ☐ location/environmental factors were described.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Industrial GPS applications were described. (1.2)

- ☐ Installation considerations, requirements and procedure for GPS systems was explained: (1.3)
- ☐ satellite visibility considerations were explained
- ☐ standards of accuracy of differing set-ups was explained
- ☐ data transmission considerations were explained
- ☐ ground based error correction considerations were explained
- ☐ WAAS and DGPS set-up considerations were explained
- ☐ codes used during set-up were explained.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Maintenance considerations, requirements and procedure for GPS systems were explained. (1.4)

- ☐ manufacturer specified maintenance considerations were explained
- ☐ workplace maintenance schedules were explained.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 2: Install and commission GPS receivers, displays, and antennas

Describe the main parameters of a GPS system set up that you have set up and commissioned to be used for your assessment event. This must be a system that has a ground correction system component.

(2.1)

Apprentice Diary – Set-up (2.1)

Date/s	Describe GPS set-up work done and dates. Explain any choices you have made and include reference to: • regulatory codes • power supplies • shielding and bonding • location and environmental factors

Apprentice Diary – Testing and adjustment (2.2)

Date/s	Describe testing and adjustment work done and dates. Explain any choices made and include reference to: • satellite visibility • standards of accuracy • data transmission • ground based error correction • WAAS and DGPS.

Describe the documentation prepared to support the set-up (2.3)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice set-up GPS receivers, displays, and antennas in accordance with manufacturer specifications, industry practice and regulatory codes: (2.1)

- ☐ power supplies were setup
- ☐ shielding and bonding was done
- ☐ location and environmental factors were considered.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice tested and adjusted GPS receivers in accordance with manufacturer installation specifications, industry practice and regulatory codes: (2.2)

- ☐ satellite visibility was checked/ adjustments made as required
- ☐ standards of accuracy were identified and adjusted as required
- ☐ data transmission efficiency was checked
- ☐ ground based error corrections were tested
- ☐ WAAS and DGPS set-up/effectiveness was tested.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Installation was documented in accordance with company standards. (2.3)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 3: Maintain GPS receivers, displays, and antennas.

Apprentice Diary – Maintenance of GPS systems (3.1)

Date/s	Describe GPS maintenance work done and dates. Identify the reasons why the maintenance work has been carried out, for example manufacturer recommendation etc.

This task requires you to demonstrate competence related to the following GPS elements. Identify maintenance work that you have carried out on these elements by completing the table below: (3.1)

Maintenance element	Maintenance dates and details
satellite visibility – check	
standards of accuracy	
data transmission	
ground based error correction	
WAAS and DGPS	
power supplies	
shielding and bonding	
location and environmental factors.	

Provide details of maintenance documentation that has been completed to support maintenance of GPS systems. (3.2)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice maintained GPS receivers, displays and antennas in accordance with manufacturer specifications, maintenance schedules industry practice and regulatory codes: (3.1)

- ☐ satellite visibility was checked and maintained accordingly
- ☐ standards of accuracy were checked and alterations made if required
- ☐ data transmission aspects were checked and corrected if necessary
- ☐ ground based error correction was checked
- ☐ WAAS and DGPS correction was checked
- ☐ power supplies were checked/maintained if necessary
- ☐ shielding and bonding of components was checked/maintained if required
- ☐ location and environmental factors were checked for effects on GPS system operation.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice documented maintenance in accordance with company standards. (3.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Maintain electric arc furnace in accordance with regulatory standards, manufacturer specifications and company maintenance standards.**

Credit 3

Prerequisite

Competency Standard IE207-9WA, Demonstrate knowledge of maintenance of arc and induction furnaces

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)

WorkSafeBC Occupational Health and Safety (OHS) regulations.

Sector references

Mines Act [RSBC 1996] CHAPTER 293
CAN/CSA-M421-00 (R2005) - Use of electricity in mines

Definitions

I/O – input output
PLC – programmable logic controller
Regulatory codes – all Acts, Regulations and standards in force including those in references above

Task 1: Maintain electric arc furnaces in accordance with manufacturer specifications and company maintenance standards.

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:

R1 ***Maintain electric arc furnace***

Task 1: Maintain electric arc furnaces in accordance with manufacturer specifications and company maintenance standards

Identify what would cause the following electric arc furnace components to require maintenance and include any relevant workplace examples/dates. (1.1)

Component	When /why is maintenance required	Workplace examples
arc furnace transformers and tap changers		
capacitor banks		
bus systems and live bus water cooled systems		
flow		
pressure		
temperature indicators and moisture detectors		
basic control circuits		
arc furnace in relationship to plant processes		

Apprentice Diary – Electric arc furnace maintenance (1.1)

Date/s	Describe general maintenance jobs undertaken, reasons for maintenance and dates undertaken. Explain any choices you have made.

Competence in the following elements of electric arc furnace maintenance is required for this competency standard. Identify relevant jobs/maintenance activities and the dates for each element:(1.2)

Element – add activities	Job/date
transformer oil testing	
hydraulic control adjustments	
PLC and stand alone computer operation	
oil pump alarm verifications	
test tap-changer	
phase imbalances or errors on feeder management and incoming switchgear	
cooling water temperature adjustment	
pumps and alarms	

Element – add activities	Job/date
outgoing bus connections	
routing and slipping equipment	
infrared scanning of bus work	
access manufacturer wear recommendations	
monitor signs of arching on frameworks	
arc furnace PLC mainframe and remote I/O	
battery integrity	
alarm panel parameters.	

What documentation was prepared to support the maintenance activities? (1.3)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Key components/elements of electric arc furnace operation requiring maintenance were identified including: (1.1)

- ☐ arc furnace transformers and tap changers
- ☐ capacitor banks
- ☐ bus systems and live bus water cooled systems
- ☐ flow
- ☐ pressure
- ☐ temperature indicators and moisture detectors
- ☐ basic control circuits
- ☐ arc furnace in relationship to plant processes.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Electric arc furnaces were maintained in accordance with industry practice and regulatory codes including: (1.2)

- ☐ transformer oil testing
- ☐ hydraulic control adjustments
- ☐ PLC and stand alone computer operation
- ☐ oil pump alarm verifications
- ☐ test tap-changer
- ☐ phase imbalances or errors on feeder management and incoming switchgear
- ☐ cooling water temperature adjustment
- ☐ pumps and alarms
- ☐ outgoing bus connections
- ☐ routing and slipping equipment
- ☐ infrared scanning of bus work
- ☐ access manufacturer wear recommendations
- ☐ monitor signs of arching on frameworks
- ☐ arc furnace PLC mainframe and remote I/O
- ☐ battery integrity
- ☐ alarm panel parameters.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Maintenance was documented in accordance with company standards. (1.3)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Maintain induction furnaces in accordance with regulatory standards, manufacturer specifications and company maintenance standards.**

Credit 3

Prerequisite

Competency Standard IE207-9WA, Demonstrate knowledge of maintenance of arc and induction furnaces

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)
WorkSafeBC Occupational Health and Safety (OHS) regulations

Sector references

Mines Act [RSBC 1996] CHAPTER 293
CAN/CSA-M421-00 (R2005) - Use of electricity in mines

Definitions

SCR – silicone control rectifier

Regulatory codes – all Acts, Regulations and standards in force including those in references above

Task 1: Maintain induction furnaces in accordance with manufacturer specifications and company maintenance standards.

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:
R2 ***Maintain induction furnace***

Task 1: Maintain induction furnaces in accordance with manufacturer specifications and company maintenance standards.

Identify what would cause the following induction furnace components to require maintenance and include any relevant on job workplace examples/dates. (1.1)

Component	When/why is maintenance required	Workplace examples
inductors		
SCRs		
capacitors		
auto transformers		
live bus water cooling		
breaker control circuits and settings		
integration into plant processes		
basic control circuits and metering		

Apprentice Diary – Induction furnace maintenance (1.1)

Date/s	Describe general maintenance jobs undertaken, reasons for maintenance and dates undertaken. Explain any choices you have made.

Competence in the following elements of induction furnace maintenance is required for this competence standard. Identify relevant jobs/maintenance activities and the dates for each element:(1.2)

Element	Job/date /details
high voltage safety	
high current safety	
thermocouple control and alarm unit maintenance	
safety of interlocking and breaker circuits	
induction pot shell thermocouple operation	
trip and light settings on alarm and control circuits	
auto transformer grounds and specified resistance standards	
test capacitor value range against name tag data	
maintenance schedules	

What documentation was prepared to support the maintenance activities? (1.3)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Key components of induction furnaces that require maintenance were identified including: (1.1)

- ☐ inductors
- ☐ SCRs
- ☐ capacitors
- ☐ auto transformers
- ☐ live bus water cooling
- ☐ breaker control circuits and settings
- ☐ integration into plant processes
- ☐ basic control circuits and metering.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Induction arc furnaces were maintained in accordance with industry practice and regulatory codes including: (1.2)

- ☐ high voltage safety
- ☐ high current safety
- ☐ thermocouple control and alarm units
- ☐ safety interlocking and breaker circuits
- ☐ induction pot shell thermocouple operation
- ☐ trip and light settings on alarm and control circuits
- ☐ auto transformer grounds and specified resistance standards
- ☐ test capacitor value range against name tag data
- ☐ maintenance schedules.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Maintenance was documented in accordance with company standards. (1.3)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

NEW WORKPLACE ELECTIVE 2012 – ASSESSMENT CRITERIA TO BE DEVELOPED

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:

O5 ***Demonstrate knowledge of electrolytic cell technology and safety considerations***

SPECIFICATION

People credited with this standard are able to:

- **Access and comply with standards in the Mines Act and CSA pertaining to industrial electrical applications, installations, operations and standards.**

Credit 2

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)

Mines Act [RSBC 1996] CHAPTER 293

CAN/CSA-M421-00 (R2005) - Use of electricity in mines

WorkSafeBC Occupational Health and Safety (OHS) regulations.

Task 1: **Demonstrate and apply knowledge of the Mines Act.**

Task 2: **Demonstrate and apply knowledge of the CSA – Use of electricity in mines**

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:
G4 ***Access and comply with mining electrical regulations***

Task 1: Demonstrate and apply knowledge of the Mines Act.

Describe the purpose, layout, legal force and organization of the Mines Act. (1.1)

(add paper if required)

Identify the main sections and briefly describe the content of the Mines Act that applies to electrical installations on mine sites. Include: (1.2)

- a description of how that information can be accessed including index referencing
- how the sections are organized
- the types of media that you can use to access the info – such as media, print etc and the different access methods.

Identify a minimum of 2 electrical installation related examples from your workplace of compliance with the Mines Act on a mine site: (1.3)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice described the Mines Act: (1.1)

- ☐ purpose was described
- ☐ layout of the act was described
- ☐ legal force was described
- ☐ organization of the act was described.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice described main sections and content of the Mines Act that applied to electrical installations on mine sites: (1.2)

- ☐ indexing was described
- ☐ section organization was described
- ☐ types of media that can be used to access the information were identified.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice complied with parts of the Mines Act applicable to electrical installations on mine sites. (1.3)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 2: Demonstrate and apply knowledge of the CSA – Use of electricity in mines

Describe the purpose, layout, legal force and organization of the CSA – Use of electricity in mines.(2.1)

(add paper if required)

Identify the main sections and briefly describe the content of the *CSA - Use of electricity in mines*. (2.2)
Include:

- a description of how that information can be accessed including index referencing
- how the sections are organized
- the types of media that you can use to access the info – such as media, print etc and the different access methods.

Identify a minimum of 2 examples from your workplace of compliance with the *CSA – Use of electricity in mines:* (2.3)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice described the CSA - Use of electricity in mines: (2.1)

- ☐ purpose was described
- ☐ layout of the CSA was described
- ☐ legal force was described
- ☐ organization of the CSA was described.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Main sections and content of the CSA - Use of electricity in mines was described: (2.2)

- ☐ indexing was described
- ☐ section organization was described
- ☐ types of media that can be used to access the information were identified.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice complied with content of the CSA - Use of electricity in mines. (2.3)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Install and maintain detection systems to warn of the presence of: H2S, methane LEL, O2 deficiency, SO2, CO2.**

Credit 4

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)
CAN/CSA-6.19 – Gas equipment standards
WorkSafeBC Occupational Health and Safety (OHS) regulations.

Sector references

CAN/CSA-Z276 – Liquefied Natural Gas (LNG) – Production, Storage, and Handling
CAN/CSA-Z662 – Oil and Gas Pipeline Systems

Definitions

%LEL – lower explosive level
H_2S – hydrogen sulphide
SO_2 – Sulphur dioxide
O_2 deficiency – % in air
CO – carbon monoxide
Ppm – parts per million
Regulatory codes – all Acts, Regulations and standards in force including those in references above.

Task 1: **Install gas detection systems.**

Task 2: **Maintain gas detection systems.**

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:
Q14 ***Install and maintain gas detection equipment***

Task 1: Install gas detection systems.

Identifying hazards and legislation

Outline potential gas hazards examples in terms of: explosive limits, poisoning, asphyxiation and deficient atmospheres (and any others): (1.1)

Identify the legislative requirements that apply to each of the gas hazard examples by completing the table below: (1.1)

Hazard	Legislative requirement (or regulatory code)
explosive limits	
poisoning	
asphyxiation	
deficient atmospheres	

Apprentice Diary – Installing sensors and equipment (1.2)

Date/s	Outline the details and dates of installation of sensors and equipment. Explain any choices you have made and include: • O_2 deficiency • %LEL and H_2S detection • alarm circuits • failsafe power supplies • control bus • shutdown circuits • detection and alarm parameters. Installation may include: • SO_2 • CO. *Note: re-installing may be used to assess competency on installing as long as all installation considerations are demonstrated.*

Provide details of documentation (completed log book etc) of installation according to legal requirements and company standards. (1.3)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice identified potential gas hazards and legislative requirements that govern installation and maintenance: (1.1)

- ☐ explosive limits were identified
- ☐ poisoning hazards were identified
- ☐ asphyxiation hazards were identified
- ☐ deficient atmosphere hazards were identified
- ☐ regulatory codes that apply were identified.

Assessor/ verifier name: _____ ***Signature:*** _____ ***Date:*** _____

☐ Apprentice installed gas sensors and detection equipment in accordance with manufacturer specifications and regulatory code requirements: (1.2)

- ☐ O_2 deficiency equipment was installed
- ☐ %LEL and H_2S detection equipment was installed
- ☐ alarm circuits were installed
- ☐ failsafe power supplies were installed
- ☐ control bus was installed
- ☐ shutdown circuits were installed
- ☐ detection and alarm parameters were set.

Note: re-installing may be used to assess competency on installing as long as all installation considerations are demonstrated.

Assessor/ verifier name: _____ ***Signature:*** _____ ***Date:*** _____

☐ Documentation was completed to support installation in accordance with legal requirements and company standards. (1.3)

Assessor/ verifier name: _____ ***Signature:*** _____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name: _____ ***Signature:*** _____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 2: Maintain gas detection systems.

Apprentice Diary – Gas system maintenance (2.1)

Date/s	Outline the details and dates of maintenance of sensors and equipment. Explain any choices you have made. Maintenance must cover: • %LEL and H_2S detection • control bus • alarm circuits • failsafe power supplies • detection and alarm parameters. • May include • SO_2 • CO

Provide details of documentation (completed log book etc) of maintenance according to legal requirements and company standards. (2.2)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice maintained gas sensors and detection equipment to manufacturer specifications and regulatory code requirements including: (2.1)

- ☐ %LEL and H_2S detection equipment maintained
- ☐ control bus maintained
- ☐ alarm circuits maintained
- ☐ failsafe power supplies maintained
- ☐ detection and alarm parameters set.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Log book and documentation of maintenance was completed in accordance with legal requirements and company standards. (2.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Install and maintain liquid separation and refractionation controls to equipment manufacturer standard, process design parameters, and regulatory codes.**

Credit **4**

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)
WorkSafeBC Occupational Health and Safety (OHS) regulations

Sector References

CAN/CSA-6.19 – Gas equipment standards
CAN/CSA-Z276 – Liquefied Natural Gas (LNG) – Production, Storage, and Handling
CAN/CSA-Z662 – Oil and Gas Pipeline Systems

Definitions

Regulatory codes – all Acts, Regulations and standards in force including those in references above.

Task 1: **Demonstrate knowledge of liquid separation and refractionation.**

Task 2: **Install controllers for process plant control.**

Task 3: **Maintain controllers for process plant control.**

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:
Q15 ***Install and maintain controls for liquid separation and refractionation***

Task 1: Demonstrate knowledge of liquid separation and refractionation.

Describe the processes of liquid separation and refractionation below. Include reference to or additionally describe the following: (1.1)

- integration of the liquid separation and refractionation processes into plant processes
- techniques for separation and refractionation and related process controls
- pneumatic controls used
- electronic controls
- radioactive and float controls
- refining processes
- regulatory codes.

Note: add extra paper if required

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Liquid separation and refractionation and regulatory code requirements were described including: (1.1)

- ☐ integration into plant processes
- ☐ techniques and related process controls
- ☐ pneumatic controls
- ☐ electronic controls
- ☐ radioactive and float controls
- ☐ refining processes
- ☐ regulatory codes.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 2: Install controllers for process plant control.

Outline the details of a control system installation include: (2.1, 2.2)

- the main component details and specifications used for installation
- the regulatory codes and standards used
- any legal requirements

Other details may include techniques and processes used for the separation/refractionation and integration into plant processes. Refer to or attach drawings/ sketches etc to supplement information if preferred.

Apprentice Diary (2.3)

Date/s	Describe a separation/refractionation controller installation that you have completed and the dates. Explain any choices you have made and include applicable: • engineering standards • manufacturer specifications • regulatory codes • integration into plant processes • techniques and related process controls.

What documentation was prepared to back up the installation? (2.4)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice identified processes, and controls for installation. (2.1)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice identified the requirements that govern the installation of liquid separation and refractionation controls including: (2.2)

- ☐ engineering standards
- ☐ manufacturer specifications
- ☐ legal requirements
- ☐ regulatory codes.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice installed controllers for liquid separation control, liquid level control and refractionation control, in accordance with regulatory code requirements for electrical applications in explosive environments, including: (2.3)

- ☐ engineering standards
- ☐ manufacturer specifications
- ☐ regulatory codes
- ☐ integration into plant processes
- ☐ techniques and related process controls.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice documented installation to company standards. (2.4)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Task 3: Maintain controllers for process plant control.

Apprentice Diary – Maintenance (3.1)

Date/s	Outline the maintenance activities and dates. Explain any choices you have made and include: • engineering standards • manufacturer specifications • regulatory codes • integration into plant processes • techniques and related process controls.

What documentation was prepared to support the maintenance? (3.2)

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice maintained controllers for liquid separation control, liquid level control and refractionation control, in accordance with regulatory code requirements for electrical applications in explosive environments, including observing the following factors: (3.1)

- ☐ engineering standards
- ☐ manufacturer specifications
- ☐ regulatory codes
- ☐ integration into plant processes
- ☐ techniques and related process controls.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Maintenance was documented in accordance with company standards. (3.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Install and maintain gas metering equipment and controls in stations and remote metering sites.**

Credit 4

Prerequisite

Competency Standard IE214-4TC, Demonstrate knowledge of gas metering installation and maintenance.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)
CAN/CSA-6.19 – Gas equipment standards
CAN/CSA-Z276 – Liquefied Natural Gas (LNG) – Production, Storage, and Handling
CAN/CSA-Z662 – Oil and Gas Pipeline Systems
WorkSafeBC Occupational Health and Safety (OHS) regulations.

Definitions

PDI – pipeline direct inlet
LEL – lower exposure level
Regulatory codes – all Acts, Regulations and standards in force including those in references above.

Task 1: Install and maintain gas metering and control equipment in remote metering stations.

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:
Q16 Install and maintain gas metering equipment

Task 1: Install and maintain gas metering and control equipment in remote metering stations.

Describe/summarize a gas metering and control installation that you have completed.
Include identification of the regulatory codes that applied to the installation (1.1)

Apprentice Diary (1.2)

Date/s	Describe the work done and dates of work installing equipment in a gas metering and control station installation. Explain any choices you have made. The installation must include the following which the diary should make reference to: • remote metering stations – safety hazards, emergency respiration equipment (Scott air packs) • read and interpret piping and valving diagrams • gas quality analyzers • specific gravity, chemical makeup and heating value • personal LEL detection • transmitters • turbines • PDI meters • records and maintenance • legal record keeping standards.

Apprentice Diary - Maintaining gas metering equipment installations **(1.3)**

Date/s	Describe the maintenance work done and dates of work done. Explain any choices you have made. Maintenance may include elements from the following list – though possibly not all elements. • remote metering and pumping stations – safety hazards, emergency respiration equipment (Scott air packs) • read and interpret piping and valving diagrams • gas quality analyzers • specific gravity, chemical makeup and heating value • personal LEL detection • transmitters • turbines • PDI meters • records and maintenance • legal record keeping standards.

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice identified and complied with regulatory code requirements that govern installation and maintenance of gas metering and control equipment. (1.1)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice installed metering and control equipment and completed the appropriate documentation to meet legal requirements in accordance with regulatory code requirements and manufacturer specifications including: (1.2)

- ☐ following safety precautions were for remote metering stations – safety hazards, emergency aspiration equipment (Scott air packs)
- ☐ read and interpreted piping and valving diagrams
- ☐ gas quality analyzers were used
- ☐ specific gravity, chemical makeup and heating value were determined
- ☐ personal LEL detection was determined
- ☐ transmitters were installed
- ☐ turbines installed
- ☐ PDI meters installed
- ☐ records/documentation prepared including legally required documentation.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice maintained metering and control equipment and completed the appropriate documentation to meet legal requirements in accordance with regulatory code requirements manufacturer specifications. (1.3)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Install and maintain analytical measurement equipment for industrial process plants.**

Credit 4

Prerequisite

Competency Standard IE216-4TC, Demonstrate knowledge of installation and maintenance of analytical measurement equipment.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)
WorkSafeBC Occupational Health and Safety (OHS) regulations.

Sector References

CAN/CSA-6.19 – Gas equipment standards
CAN/CSA-Z276 – Liquefied Natural Gas (LNG) – Production, Storage, and Handling
CAN/CSA-Z662 – Oil and Gas Pipeline Systems.

Definitions

Regulatory codes – all Acts, Regulations and standards in force including those in references above.
H_2S – hydrogen sulphide

Task 1: Install and maintain analytical measurement equipment to regulatory code requirements and manufacturer specifications

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:
Q7 Install and maintain analytical measurement equipment

Task 1: Install and maintain analytical measurement equipment to regulatory code requirements and manufacturer specifications.

Explain the main standards, methods and equipment used for analytical measurement.
Include the following key elements in your discussion: (1.1)

- hazards of mediums measured (corrosive, poisonous gas etc.)
- analyzers
- laboratory standards of precision
- conductivity
- Ph
- H_2S
- flue gas
- calibration.

Note: add extra paper if required

Apprentice Diary – Installing analyzers (1.2)

Date/s	Identify the analyzer installations that you have completed. Explain any choices you made, identify the regulatory codes that applied and the documentation that was completed to support the installations in accordance with industry best practice. **Analyzer installation activities** may include activities such as: • record logging • gas measurement tubing and piping practice • 'zero', 'span', 'linearity' adjustments • control loop voltages • alarms • shutdowns and parameter adjustment • safe work permitting • access and interpret process documentation and field manuals

Apprentice Diary – Maintaining analyzers (1.3)

Date/s	Identify the analyzer maintenance that you have completed. Explain any choices you made, identify the regulatory codes that applied and the documentation that was completed to support the installations in accordance with industry best practice. **Analyzer maintenance activities** may include activities such as: • record logging • gas measurement tubing and piping practice • 'zero', 'span', 'linearity' adjustments • control loop voltages • alarms • shutdowns and parameter adjustment • safe work permitting • access and interpret process documentation and field manuals.

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice explained aspects of analytical measurement standards and equipment including hazards of mediums including the following: (1.1)

- ☐ hazards of mediums measured (corrosive, poisonous gas etc.)
- ☐ analyzers
- ☐ laboratory standards of precision
- ☐ conductivity
- ☐ Ph
- ☐ H_2S
- ☐ flue gas
- ☐ calibration.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice installed analyzers, in compliance with regulatory code requirements and completed documentation requirements to meet industry best practice. (1.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice maintained analyzers, in compliance with regulatory code requirements and completed documentation requirements to meet industry best practice. (1.3)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Demonstrate and apply knowledge of OPR 99 of the National Energy Board regulations in all operations involving the piped transmission of hydrocarbons.**

Credit 2

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)
CAN/CSA-6.19 – Gas equipment standards
CAN/CSA-Z276 – Liquefied Natural Gas (LNG) – Production, Storage, and Handling
CAN/CSA-Z662 – Oil and Gas Pipeline Systems
Onshore Pipeline Regulations 1999
WorkSafeBC Occupational Health and Safety (OHS) regulations

Definitions

OPR 99 – Onshore Pipeline Regulations 1999.

Task 1: Demonstrate knowledge of and comply with onshore pipeline regulations in terms of the OPR 99

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:

G5 Demonstrate and apply knowledge of onshore pipeline regulations

Task 1: Demonstrate knowledge of and comply with onshore pipeline regulations in terms of the OPR 99.

Describe the OPR99 regulations, purpose and interpretation. Include descriptions of: (1.1)

- purpose of the OPR 99 of the National Energy Board Act
- application
- legal force
- method of organization
- access to the Act
- mediums available (print, CD-ROM, on line)
- hydrocarbon service.

Explain the application of the OPR 99 to actual worksites piping hydrocarbons. (1.2)
Identify the worksites and explain the OPR99 relevant details of the installations including:

- material specifications
- emergency requirements
- environmental impacts
- pipeline control competencies.

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice described the OPR99 regulations, purpose and interpretation including: (1.1)

- ☐ purpose of the OPR 99 of the National Energy Board Act
- ☐ application
- ☐ legal force
- ☐ method of organization
- ☐ access to the Act
- ☐ mediums available (print, CD-ROM, on line)
- ☐ hydrocarbon service.

☐ Apprentice explained and applied the OPR 99 in terms of work sites involved in piping hydrocarbons in accordance with industry practice and codes including: (1.2)

- ☐ material specifications
- ☐ emergency requirements
- ☐ environmental impacts
- ☐ pipeline control competencies.

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Describe basic recovery boiler control system operation and maintain recovery boiler control systems in accordance with safety regulations and plant operational requirements.**

Credit 3

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)

Safety Standard Act, Power Engineers, Boiler, Pressure Vessel And Refrigeration Safety Regulation, BC Reg. 104/2004, M62/2004, Queen's Printer, Victoria, 2004

WorkSafeBC Occupational Health and Safety (OHS) regulations

Company insurer regulations and guidelines.

Task 1: **Describe recovery boiler operation and principles of control.**

Task 2: **Maintain recovery boiler control systems in accordance with safety regulations and plant operational requirements.**

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:

R3 ***Maintain recovery boiler control systems***

Task 1: Describe recovery boiler operation and principles of control.

Describe the operation of recovery boilers and the principles of control.
Include the following in the discussion: (1.1)

- pressure vessel types
- fuel and burners
- flame safety systems and associated peripheral drives and sensors
- emergency shutdown procedures
- regulatory and safety codes.

Use sketches/drawings to supplement your description if preferred.

Task 2: Maintain recovery boiler control systems in accordance with safety regulations and plant operational requirements.

Outline a boiler control system maintenance event that you have been involved with: (2.1)

Describe/identify the manufacturer's drawings/plans/manuals/specifications that were interpreted during the maintenance: (2.1)

Apprentice Diary – Maintenance (2.2)

Date/s	Identify boiler system maintenance activities carried out and dates. Explain any choices you made and include the following maintenance items: • operations interface • logic systems • gas controls • flame sensors • cameras and fuel systems.

Apprentice Diary – Shutdown (2.3)

Date/s	Identify a boiler control system shutdown event that you have carried out the dates and details. Explain any choices you made and include reference to the use of: • electric rotork valves • gas valves • fuel shut offs • fuel safeties and input/expulsions of fuels and gases, precipitators and scrubbers.

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice described boiler operation and principles of control in accordance with industry practice, including: (1.1)

- ☐ pressure vessel types
- ☐ fuel and burners
- ☐ flame safety systems and associated peripheral drives and sensors
- ☐ emergency shutdown procedures
- ☐ regulatory and safety codes.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice accessed and correctly interpreted process diagrams and manufacturer specifications and manuals in accordance with industry practice. (2.1)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice maintained boiler control systems in accordance with safety regulations and plant operational requirements, including: (2.2)

- ☐ operations interface
- ☐ logic systems
- ☐ gas controls
- ☐ flame sensors
- ☐ cameras and fuel systems.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice shutdown boiler control systems in accordance with industry practice, including: (2.3)

- ☐ electric rotork valves
- ☐ gas valves
- ☐ fuel shut offs
- ☐ fuel safeties and input/ expulsions of fuels and gases, precipitators and scrubbers.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:***_____

Assessor Signature: _____ ***Date:***_____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.

SPECIFICATION

People credited with this standard are able to:

- **Install and maintain scanning and optimization equipment to manufacturer specifications.**

Credit 4

Prerequisite

Competency Standard IE222-4TC, Demonstrate knowledge of the principles of scanning and optimization equipment

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Quality Assurance

Any assessor assessing against this competency standard must be a qualified electrician.

References

The Canadian Electrical Code, Part I, Canadian Standards Association, most current edition (CEC)
WorkSafeBC Occupational Health and Safety (OHS) regulations.

Definitions

PLC – programmable logic controller.

Task 1: Install, calibrate and maintain scanning and optimization equipment to manufacturer specifications.

This unit relates to the following competency number and topic in the provincial OAC and Program Outline:

R4 Install and maintain scanning and optimization equipment

Task 1: Install, calibrate and maintain scanning and optimization equipment to manufacturer specifications.

Apprentice Diary – Installation and Calibration (1.1)

Date/s	Identify events where you have installed and calibrated scanning and optimization equipment – in accordance with manufacturer specs. Explain any choices you made and include the following aspects of the installation: • environmental considerations, calibration and process integration • access and interpret manufacturer manuals and specifications • wire, bond and shield components • process correction and feedback loops • optimizer computer and machinery PLC interfaces and communication • maintenance schedules.

Apprentice Diary – Maintenance **(1.2)**

Date/s	Identify events where you have maintained and calibrated scanning and optimization equipment and explain any choices you made.

Assessor Checklist

I verify the apprentice is able to perform the following task(s) to the standard outlined and attest to his/her competence.

☐ Apprentice installed and calibrated scanning and optimization equipment including observing the following aspects of installation: (1.1)

- ☐ environmental considerations, calibration and process integration
- ☐ access and interpret manufacturer manuals and specifications
- ☐ wire, bond and shield components
- ☐ process correction and feedback loops
- ☐ optimizer computer and machinery PLC interfaces and communication
- ☐ maintenance schedules.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ Apprentice maintained and calibrated scanning and optimization equipment: (1.2)

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

☐ All apprentice's explanations, descriptions, and activities complied with current legislation, including the Canadian Electrical Code, WorkSafeBC or other applicable regulations, and industry practice.

Assessor/ verifier name:_____ ***Signature:***_____ ***Date:*** _____

Note: if simulation was used for any of the tasks, attach a brief description of the exercise to this competency.

Additional Supporting Evidence

(To be completed by the apprentice and signed by the assessor)

Describe what workplace records are available to verify you performed this work.

Describe where a moderator can locate these records to verify your work when doing a quality check.

Name and describe the CEC rules required when you performed these tasks.

Name applicable manufacturer guidelines that were followed when doing these tasks.

Apprentice Signature: _____ ***Date:*** _____

Assessor Signature: _____ ***Date:*** _____

Additional Questions

Attach written notes of any additional questions asked of the apprentice and answers given. Ensure they are signed and dated by both the apprentice and assessor.