

Level Three

Compulsory Workplace Competency Standards assessed using the assessment guides in the Workplace Logbook		
Code	Title	Credit
IE123-3WC	Write technical documents	3
IE124-3WC	Demonstrate Knowledge of leading teams	2
IE127-3WC	Apply knowledge of analytical troubleshooting techniques	4
IE130-3WC	Use phase rotation meter	1
IE136-3WC	Install and maintain PLC hardware	7
IE137-3WC	Install and maintain PLC networks	7
IE142-3WC	Install and maintain low voltage circuits	12
IE151-3WC	Install and maintain AC motors	9

Specification

People credited with this standard are able to:

Write documents which explain or prescribe standards and specifications for electrical and electronic installation, maintenance and troubleshooting.

Credit 3

Quality Assurance

Any assessor assessing against this competency standard must be competent in the topic and have completed the assessor registration competency.

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.

Task1

Write documents which are easily interpreted and provide the reader with the correct level of detail and the relevant electrical, procedural, mechanical and architectural aspects of the subject.

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.

Assessor Observation

(To be completed by the assessor after the apprentice has performed the tasks competently in the workplace)

I confirm I have seen the apprentice perform the following task to the standard outlined and attest to his or her competence. *Tick the boxes you have observed*

- technical English conventions
 - business English conventions
 - trade names and terms.
 - standards for clear writing and those which facilitate ease of interpretation.
 - intended audiences
 - word processing layout conventions.
-
- 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 Name (Printed) _____

Signature: _____

Date: _____

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.

Which manufacturer guidelines 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.

Task verification

Obtain confirmation from a third party who will verify you have carried out the tasks as assigned to the standard described.

Name of task verifier: _____

Position in the company: _____

Signature of task verifier: _____

Date: _____

Apprentice Signature: _____

Date: _____

Specification

People credited with this standard are able to:

Describe principles of leadership to support a team of personnel in safely and efficiently realizing assigned objectives.

Credit 2

Quality Assurance

Any assessor assessing against this competency standard must be competent in the topic and have completed the assessor registration competency.

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.

Task1

Describe principles of effective leadership in assembling, planning the work of and leading a team to accomplish assigned goals safely and efficiently.

Task 2

Describe techniques to ensure the safe execution of maintenance and installation procedures when working with a variety of personnel.

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.

Demonstrate knowledge of leading teams

Assessor Observation

(To be completed by the assessor after the apprentice has performed the tasks competently in the workplace)

I confirm I have seen the apprentice perform the following task to the standard outlined and attest to his or her competence. *Tick the boxes you have observed*

1.1 Describe elements of effective leadership.

Must include

- active communication
- planning according to the resources of team members
- motivation
- mentorship
- goal setting
- achieving objectives under pressure.

1.2 Identify and describe industry supervisory and reporting standards.

1.3 Identify and describe styles of effective leadership.

Must include

- benefit of matching leadership style to personality.

2.1 Describe methods for managing complex procedures so that the work is carried out safely.

Must include

- task and step breakdown
- feedback loop
- contingency plan
- non-verbal signalling

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 Name (Printed) _____

Signature: _____ Date: _____

Demonstrate knowledge of leading teams

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.

Which manufacturer guidelines 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.

Task verification

Obtain confirmation from a third party who will verify you have carried out the tasks as assigned to the standard described.

Name of task verifier: _____

Position in the company: _____

Signature of task verifier: _____

Date: _____

Apprentice Signature: _____

Date: _____

Specification

People credited with this standard are able to:

Apply knowledge of systematic procedures for efficiently identifying the source and type of malfunction or fault in equipment.

Credit 4

Prerequisite

Competency Standard IE126-1TC, Demonstrate knowledge of analytical troubleshooting techniques

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 with Red Seal endorsement and industrial experience; and have completed the assessor registration competency.

Tasks

Task 1

Use flow charts, process charts and other analytical troubleshooting techniques to identify malfunctions and recommend solutions to repair equipment and circuits.

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.

Apply analytical troubleshooting techniques

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.

Which manufacturer guidelines 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.

Task verification

Obtain confirmation from a third party who will verify you have carried out the tasks as assigned to the standard described.

Name of task verifier: _____

Position in the company: _____

Signature of task verifier: _____

Date: _____

Apprentice Signature: _____

Date: _____

Specification

People credited with this standard are able to:

Use the phase rotation meter to troubleshoot and check installation of three-phase power circuits.

Credit 1

Prerequisite

Competency Standard IE129-3TC, Demonstrate knowledge of three-phase theory; and
Competency Standard IE128-1TC, Demonstrate and apply knowledge of basic test 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 with Red Seal endorsement and industrial experience; and have completed the assessor registration competency.

References

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

Tasks

Task 1

Demonstrate proper techniques to troubleshoot and test three-phase circuits with the phase meter, correctly identifying missing phases.

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.

Identify/ describe the details of your safe use and maintenance of a phase rotation meter. Include dates: (1.2)

Assessor Observation

(To be completed by the assessor after the apprentice has performed the tasks competently in the workplace)

I confirm I have seen the apprentice perform the following task to the standard outlined and attest to his or her competence. *Tick the boxes you have observed*

- Phase rotation meter was properly maintained for safe operation. (1.1)
- Safety precautions were observed during use and care of phase rotation meter. (1.1)
- Phase rotation meter was properly used to troubleshoot and test three-phase circuits: (1.2)
 - circuit was measured using phase rotation meter to obtain information about the circuit (may include voltage)
 - safety was considered and meter was used in accordance with accepted practice and regulations
 - use of the meter identified missing phases
 - proof testing was correctly carried out
 - direction of rotation was determined using meter.
- 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 Name (Printed) _____

Signature: _____

Date: _____

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.

Which manufacturer guidelines 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.

Task verification

Obtain confirmation from a third party who will verify you have carried out the tasks as assigned to the standard described.

Name of task verifier: _____

Position in the company: _____

Signature of task verifier: _____

Date: _____

Apprentice Signature: _____

Date: _____

Specification

People credited with this standard are able to:

Install PLC hardware to CEC and maintain at an acceptable operational standard.

Credit 7

Prerequisite

Competency Standard IE134-3TC, Demonstrate and apply knowledge of PLC operation, installation and maintenance; and

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

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 with Red Seal endorsement and industrial experience; and have completed the assessor registration competency.

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.

Tasks

Task 1

Install common PLC hardware types in accordance with CEC rules and manufacturer specifications.

Task 2

Maintain PLC hardware components to acceptable operational standard.

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.

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

Assessor Observation

(To be completed by the assessor after the apprentice has performed the tasks competently in the workplace)

I confirm I have seen the apprentice perform the following task to the standard outlined and attest to his or her competence. *Tick the boxes you have observed*

Preparation for installation of PLCs (1.1)

- Preparation for installation of PLC components was carried out:
 - system specifications were accessed and manufacturer installation parameters determined
 - compatibility of PLC with environment was established
 - power supply suitability and regulation was established as being within required parameters
 - blueprints and drawings for PLC installation were located
 - I/O lists were developed/located
 - I/O modules were determined/identified.

Installation of PLCs (1.2)

Note: re-installing may be used to assess competency as long as all installation considerations are demonstrated. Simulation of installation is possible on training PLCs in the workplace.

- PLC hardware components were installed to manufacturer specifications:
 - wiring and terminations were carried out correctly
 - grounding and shielding was carried out correctly
 - software was installed and diagnostics checked
 - fusing and overload protection was carried out correctly
 - blueprints and drawings were followed correctly.

Installation was documented to comply 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 Name (Printed) _____

Signature: _____

Date: _____

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.

Which manufacturer guidelines 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.

Task verification

Obtain confirmation from a third party who will verify you have carried out the tasks as assigned to the standard described.

Name of task verifier: _____

Position in the company: _____

Signature of task verifier: _____

Date: _____

Apprentice Signature: _____

Date: _____

Specification

People credited with this standard are able to:

Maintain PLC networks to manufacturer specifications, CEC rules and to acceptable operational standard.

Credit 7

Prerequisite

Competency Standard IE134-3TC, Demonstrate and apply knowledge of PLC operation, installation and maintenance; and

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

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 with Red Seal endorsement and industrial experience; and have completed the assessor registration competency.

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.

Tasks

Task 1

Install PLC communication networks that allow PLC devices to communicate to operational standards.

Task 2

Maintain PLC networks to allow PLC devices to communicate.

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.

Identify the documentation prepared to support the PLC installation (1.3)

Assessor Observation

(To be completed by the assessor after the apprentice has performed the tasks competently in the workplace)

I confirm I have seen the apprentice perform the following task to the standard outlined and attest to his or her competence. *Tick the boxes you have observed*

Preparation for network installation (1.1)

- Prepared for installation and connection of PLC networks:
 - system specifications and manufacturer installation parameters were accessed
 - electrical drawings were accessed
 - suitability of installation confirmed OK for operating environment.

Installation and connection of the network (1.2)

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

Examples of network installation may include:

- set-up and installation of switching racks
- installation and set-up routers
- installation and set up of modems and converters
- optimization of system speed.

PLC networks were installed and connected:

- conductors were terminated correctly.

Documenting the installation (1.3)

- Installation was documented correctly to comply with company practice.
- 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 Name (Printed) _____

Signature: _____

Date: _____

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.

Which manufacturer guidelines 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.

Task verification

Obtain confirmation from a third party who will verify you have carried out the tasks as assigned to the standard described.

Name of task verifier: _____

Position in the company: _____

Signature of task verifier: _____

Date: _____

Apprentice Signature: _____

Date: _____

Specification

People credited with this standard are able to:

Install, maintain and document low voltage circuits to CEC rules and all applicable installation guidelines.

Credit 12

Prerequisite

Competency Standard IE141-2TC, Demonstrate knowledge of the installation and maintenance of low 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 with Red Seal endorsement and industrial experience; and have completed the assessor registration competency.

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

IEEE – Institute of Electrical and Electronic Engineers
ULC – Underwriters Laboratories of Canada
ISO – International standards organization
NEMA – National Electrical Manufacturers Association.

Tasks

Task 1

Install and maintain low voltage circuits to equipment specifications and safety standards.

Task 2

Install and maintain low voltage distribution equipment to applicable safety standards and manufacturer specifications.

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

IE142-3WC
Install and maintain low voltage circuits

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.

Install and maintain low voltage circuits**Assessor Observation – Install and maintain low voltage circuits**

(To be completed by the assessor after the apprentice has performed the tasks competently in the workplace)

I confirm I have seen the apprentice perform the following task to the standard outlined and attest to his or her competence.

Used low voltage diagrams and drawings (1.1)

- recognized symbol sets
- followed standards
- interpreted schematics and construction blue prints
- translated drawing updates and standards.

Installed low voltage circuits that comply with CEC rules: (1.2)

- used testing equipment
- completed appropriate termination
- finalized layout and secured safely
- installed and cable wire
- determined control points
- environmental specifications.

Note: the CEC rules define the standards to which correct installations take place and therefore are the standard for assessing installations.

Maintained low voltage circuits to equipment specifications: (1.3)

- used testing equipment
- checked terminations
- inspected layout and secure
- inspected running wire
- confirmed control points.

Note: effective maintenance procedures vary by industry sector and are dictated by operational standards – for instance in coal mines cleanliness standards differ from the standards in gas compression plants.

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 Name (Printed) _____

Signature: _____

Date: _____

Install and maintain low voltage circuits**Assessor Observation – Install and maintain low voltage distribution equipment**

(To be completed by the assessor after the apprentice has performed the tasks competently in the workplace)

I confirm I have seen the apprentice perform the following task to the standard outlined and attest to his or her competence. *Tick the boxes you have observed*

- Used the appropriate power distribution equipment types that meet the requirements of power distribution standards: (2.1)

- used correct types of equipment for load ratings
- complied with appropriate standards – identify which:
 - Canadian Electrical Code (CEC)
 - Canadian Standards Association (CSA)
 - Underwriter Laboratory Canada (ULC)
 - International Standards Organization (ISO).

Note: proper selection of required equipment varies across applications.

- Installed low voltage equipment to comply with environmental factors and manufacturer specifications: (2.2)

- determined load calculation
- used appropriate wiring
- shielded and bonded as required
- referred to manufacturer specifications and manuals
- tested and tuned equipment
- secured and restrained equipment.

Note: specific attention needs to be paid to shielding, bonding and grounding as this is a fundamental key to operation and safety.

- Maintained low voltage equipment to comply with manufacturer specifications and company preventative maintenance routines: (2.3)

- performed tests and troubleshooting
- protected and cleaned components
- followed safety procedures for component replacement
- checked grounding.

Note: this may be simulated for assessment purposes if no workplace opportunity occurs, as component replacement may occur rarely in some workplaces.

- 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 Name (Printed) _____

Signature: _____

Date: _____

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.

Which manufacturer guidelines 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.

Task verification

Obtain confirmation from a third party who will verify you have carried out the tasks as assigned to the standard described.

Name of task verifier: _____

Position in the company: _____

Signature of task verifier: _____

Date: _____

Apprentice Signature: _____

Date: _____

Specification

People credited with this standard are able to:

Install and maintain AC motors to CEC rules and equipment manufacturer specifications.

Credit 9

Prerequisite

Competency Standard IE150-3TC, Demonstrate knowledge of AC 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 with Red Seal endorsement and industrial experience; and have completed the assessor registration competency.

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.

Definitions

Properly – to CEC rules and in a manner that complies with WorkSafeBC regulations.

Tasks

Task 1

Install single-phase induction and three-phase induction AC motors to CEC code standards and manufacturer specifications appropriate to the type of motor and the application.

Task 2

Maintain and troubleshoot single-phase induction and three-phase induction AC motors to applicable CEC rules and manufacturer specifications.

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.

Task 1: Install single-phase induction and three-phase induction AC motors to CEC code standards and manufacturer specifications appropriate to the type of motor and the application.

Describe 2 example motors name plate data that you have installed in the tables below (1.1)

Single-phase

Criteria	Description
frame size and characteristics	
horsepower	
amps	
voltage	
rotation speed	
service factor	
insulation class	
ambient temperature class	
Grease type	
manufacturer	
weight	
efficiency	

Three-phase

Criteria	Description
frame size and characteristics	
horsepower	
amps	
voltage	
rotation speed	
service factor	
insulation class	
ambient temperature class	
Grease type	
manufacturer	
weight	
efficiency	

Include the following preliminary information about the installations.

(1.1)

Type of information	Details
pre-installation communication carried out	
activities accessing and interpreting operation and specification manuals	
junction box positioning	
type, size and verify rotation (if required by installation set up – i.e. large pumps)	
electrical classification	
manufacturer	
verify starter	
insulation test	
leads/conductor sizing	
motor terminal wiring configuration	
supply conductor temperature and voltage rating	
cooling methods	

Assessor Observation – Install single-phase induction and three-phase induction AC motors

(To be completed by the assessor after the apprentice has performed the tasks competently in the workplace)

I confirm I have seen the apprentice perform the following task to the standard outlined and attest to his or her competence. *Tick the boxes you have observed*

Preparation for installation and set-up of AC motors was carried out: (must have observed for both single and three-phase) (1.1)

- pre-installation communication was carried out to verify the installation parameters
- manuals and information were correctly interpreted in preparation for installation
- junction box positioning was determined
- name plate data was verified including manufacturer and:
 - frame size and characteristics
 - horsepower
 - amps
 - voltage
 - rotation speed
 - service factor
 - insulation class
 - ambient temperature class
 - grease type
 - manufacturer
 - weight
 - efficiency
- electrical classification was determined
- starter was verified
- insulation test
- leads / conductor sizing
- motor terminal wiring configuration
- supply conductor temperature and voltage rating
- cooling methods.

AC motors were properly installed and set-up: (must have observed for both single and three-phase) (1.2)

- single phase
- three phase.
- commissioning procedures were followed correctly
- grounding, shielding and bonding were carried out correctly
- motor and wiring was protected
- installation was checked and tested including load test, current check and rotation verification.

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

Installation was documented in accordance with company procedures. (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 Name (Printed) _____

Signature: _____

Date: _____

Documentation

Describe the documentation that you have prepared to support the maintenance (2.3)

Single-phase

Three-phase

Assessor Observation

(To be completed by the assessor after the apprentice has performed the tasks competently in the workplace)

I confirm I have seen the apprentice perform the following task to the standard outlined and attest to his or her competence. *Tick the boxes you have observed*

Prepared for maintenance of AC motors: (2.1)

accessed and interpreted operation and specification manuals, and maintenance records.

Properly maintained AC motors: (2.2)

- safety procedures were observed
- troubleshooting techniques were used to determine required maintenance
- preventative maintenance was carried out as part of the overall maintenance process
- motor was lubricated
- motor was cleaned
- vibration analysis carried out
- current check carried out
- insulation test carried out
- pump listened to.

Note: maintenance procedures vary by industry sector in accordance with operational requirements (i.e. dust tolerance). Vibration analysis may deploy a variety of analysis techniques, some very specialized requiring specific test equipment, and should be assessed appropriately.

Documented maintenance to 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 Name (Printed) _____

Signature: _____

Date: _____

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.

Which manufacturer guidelines 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.

Task verification

Obtain confirmation from a third party who will verify you have carried out the tasks as assigned to the standard described.

Name of task verifier: _____

Position in the company: _____

Signature of task verifier: _____

Date: _____

Apprentice Signature: _____

Date: _____