

Level Four

Compulsory Workplace Competency Standards assessed using the assessment guides in this Workplace Logbook		
Code	Title	Credit
IE119-4WC	Design and draw electrical and electronic drawings including schematics, maintain documentation and produce as-built drawings	4
IE155-4WC	Install and maintain motor control, voltage control and power distribution centres	5
IE179-4WC	Install and maintain variable frequency drives (VFD)	7

Specification

People credited with this standard are able to:

Demonstrate and apply knowledge of design and drawing practice, symbols and conventions for electricians, maintenance of those drawings and create as-built drawings.

Credit 4

Prerequisite

Competency standard IE117-1TC, Demonstrate knowledge of electrical and electronic drawings; and Competency standard IE118-1TC, Demonstrate knowledge of manuals and manufacturer specifications

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).

Definitions

IEEE – Institute of Electrical and Electronic Engineers

ULC – Underwriters Laboratories of Canada

ISO – International standards organization

As-built status – any difference between planned wiring and installation and as it was actually built.

Tasks

Task 1

Plan a new electrical installation or a revision to an existing installation.

Task 2

Design electrical circuits and installation layouts.

Task 3

Interpret existing, and create new documents and drawing specifications according to organizational technical data management practice.

Task 4

Update drawings to 'as-built' status using common symbol sets and numbering standards; and file correctly to comply with organizational technical data management practice.

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 documentation

Attach or provide reference details of typical specification documentation that accompanies a design drawing such as your new drawing example – in accordance with technical data management standards. (3.3)

Task 4: Update drawings to ‘as-built’ status using common symbol sets and numbering standards, and file correctly to comply with organizational technical data management practice.

Updating drawings to as-built

Attach a sample of updated drawings showing wiring and installation changes or provide reference and details of updated drawings and jobs. (4.1)



Update documentation

Provide details of field modification documentation to accompany the as-built changes and cross referenced tracking system for drawings in accordance with technical data management practice.

Note: document tracking systems include software tools such as Autoview, contained in the PLC, or may be exclusively paper based as a drawing tracking/cross referenced system. Assessment will take differing tracking systems into account. (4.1)

Field numbering system

Provide overview details of field numbering system used to document as-built status to operations organizational needs. (4.2)

Design and draw electrical and electronic drawings including schematics, maintain documentation and produce as-built drawings

Computer aided drafting

Provide details of the drawing and technology used to create the CAD drawn electro-technology drawing – attach the drawing if possible. Include details of: (5.3, 5.4)

- file creation
- file saving and storage
- CAD tools
- CAD symbol libraries
- CAD application/s.

What conventions were used? Include: (5.1)

- layout
- content
- symbols
- labelling.

Outline the drafting practice used including: (5.2)

- drawing content
- scaling
- labelling
- reference points.

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*

- Described principles of efficient circuit design and equipment layout and how these will be addressed in the design: (1.1)

Specify which principles were identified.

- Identified installation requirements and design constraints for circuits and equipment. (1.2)

- Explained regulatory requirements that must be addressed in the design. (1.3)

- Design incorporated principles of ease of assembly and disassembly in types of components, fastenings and restraints. (2.1)

Note: the level of detail desired for competence is, as an example, a design for a basic motor control circuit. This design piece could be simulated in the workplace using a commonly occurring industry design need.

- Selected components as appropriate to meet design specifications. (2.2)

- selected components allowed flexibility between proprietary standards
- selected components were suitable for interoperation/interchanging with alternative manufacturer parts (where appropriate) and still met operational specifications
- selected components met parts catalogue standards
- cost was considered.

Note: Interoperability means the ability to source electrical components from different manufacturers and fit them into circuits where other manufacturer components are specified – providing all operational specifications are met.

- Design met regulatory requirements. (2.3)

- Interpretation of existing document and drawing specifications was demonstrated - in accordance with organizational technical data management practice (3.1)

- New drawings were created with drawn components, which were able to be interpreted in accordance with industry practice. (3.2)

- title block was included
- scales were identified (when appropriate to the design work – not for schematics)
- projection was identified
- legends were used appropriately
- schedules of components were developed
- drawing met document filing specifications
- symbol conventions were used appropriately
- IEEE conventions were used appropriately
- revision details were included to appropriate convention
- detail breakouts were included appropriately.

Design and draw electrical and electronic drawings including schematics, maintain documentation and produce as-built drawings

Note: complexity of drawing and document management systems vary, assessment will reference best practice but assess workplace procedures

New specifications were developed in accordance with organizational technical data management standards. (3.3)

Wiring and installation changes were noted on existing documents to common standards. (4.1)

- documentation was modified according to the context and as-built installation
- cross referencing system for tracking drawings was used.

Note: document tracking systems include software tools such as Autoview, contained in the PLC, or may be exclusively paper based as a drawing tracking/cross referenced system. Assessment should take differing tracking systems into account.

Field numbering systems were used to document as-builts in accordance with organizational technical data management practice. (4.2)

Computer generated electro-technology drawings included relevant conventions including: (5.1)

- layout
- content
- symbols
- labelling.

Established drafting practices were used to prepare the drawing including: (5.2)

- drawing content
- scaling
- labelling
- reference points.

Drawings conformed with organizational technical data management standards including: (5.3)

- content
- drawing entities and symbols
- drawing attributes.

Appropriate CAD technology was used in the drafting process and outcomes, including: (5.4)

- file creation
- file saving and storage
- CAD tools
- CAD symbol libraries
- CAD applications.

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: _____

Design and draw electrical and electronic drawings including schematics, maintain documentation and produce as-built drawings

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 motor control centres, voltage control and power distribution centres to appropriate standards.

Credit 5**Prerequisite**

Competency standard IE152-4TC, Demonstrate knowledge of the installation and maintenance of high voltage circuits; and

Competency standard IE141-2TC, Demonstrate knowledge of the installation and maintenance of low voltage circuits; and

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.

Definitions

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

MCC – Motor Control Centres (typically 208 to 600v)

VCC – Voltage Control Centres (high voltage MCC)

PDC – Power Distribution Centre.

Tasks**Task 1**

Install and maintain motor control centres (MCC) to CEC rules and manufacturer specifications.

Task 2

Install and maintain voltage control centres (VCC) to CEC rules.

Task 3

Install and maintain power distribution centres (PDC) to CEC rules.

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 – Protective relay installation and maintenance

(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*

Protective relays were installed: (4.1)

- prints and schematics were read and modified as necessary
- manuals and specifications were accessed
- over current/undercurrent states were identified.
- safety procedures were followed.

Protective relays were maintained: (4.2)

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

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 variable frequency drives (VFD) to appropriate CEC codes, guidelines and standards.

Credit 7

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 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

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

Tasks

Task 1

Install VFD drive systems and related controls to CEC rules and manufacturer specifications.

Task 2

Maintain VFD drive systems and related controls to 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.

Documentation of installation

What documentation was prepared to record the installation – according to standard practice in your workplace? (1.3)

Assessor Observation – Installation

(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*

Install VFD drive systems and related controls to CEC rules and manufacturer specifications.

Prepared for installation of drive systems: (1.1)

located and checked specification and technical installation information.

Installed and set up drive systems: (1.2)

- control parameters were determined
- frequency and motor speed were checked
- ramping speed vs. time was checked/determined
- soft start was checked/set up
- VFD self tune performed correctly
- interface between controller and pc operated correctly.

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: _____

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: _____