

## Level Four

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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 and power distribution centres	5
IE179-4WC	Install and maintain variable frequency drives (VFD)	7

### 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 a 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:

**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.











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

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**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)

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**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)



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**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)

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**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**

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**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.

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What conventions were used? Include: (5.1)

- layout
- content
- symbols
- labelling.

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Outline the drafting practice used including: (5.2)

- drawing content
- scaling
- labelling
- reference points.

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**Assessor Observation****Assessor Checklist**

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

- 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.

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**Assessor/Task Verifier Name** \_\_\_\_\_ **Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

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

**Assessor/Task Verifier Name** \_\_\_\_\_ **Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

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

**Assessor/Task Verifier Name** \_\_\_\_\_ **Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

- 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.

**Assessor/Task Verifier Name** \_\_\_\_\_ **Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

- 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.

**Assessor/Task Verifier Name** \_\_\_\_\_ **Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

- Design met regulatory requirements. (2.3)

**Assessor/Task Verifier Name** \_\_\_\_\_ **Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

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

**Assessor/Task Verifier Name** \_\_\_\_\_ **Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

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

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- 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.

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

**Assessor/Task Verifier Name** \_\_\_\_\_ **Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

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

**Assessor/Task Verifier Name** \_\_\_\_\_ **Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

- 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.

**Assessor/Task Verifier Name** \_\_\_\_\_ **Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

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

**Assessor/Task Verifier Name** \_\_\_\_\_ **Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

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

- layout
- content
- symbols
- labelling.

**Assessor/Task Verifier Name** \_\_\_\_\_ **Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

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

- drawing content
- scaling
- labelling

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

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reference points.

**Assessor/Task Verifier Name** \_\_\_\_\_ **Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

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

- content
- drawing entities and symbols
- drawing attributes.

**Assessor/Task Verifier Name** \_\_\_\_\_ **Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

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.

**Assessor/Task 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/Task Verifier Name** \_\_\_\_\_ **Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

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

***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.

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

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

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

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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 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)

*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 power distribution centres (PDC) to CEC rules.





















**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 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.

**Assessor/Task Verifier Name \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_**

- Protective relays were maintained: (4.2)
- trip logs were accessed and interpreted
  - safe working procedures were followed.

**Assessor/Task 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/Task Verifier Name \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_**

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

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**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.

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

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

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

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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.

**IE179-4WC**  
**Install and maintain variable frequency drives (VFD)**

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**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.






**Documentation of installation**

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

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**Assessor Checklist**

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

**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.

**Assessor/Task Verifier Name \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_**

- 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.

**Assessor/Task Verifier Name \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_**

- 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/Task Verifier Name \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_**

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





**IE179-4WC**  
***Install and maintain variable frequency drives (VFD)***

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**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.

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

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

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

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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.