Australian Government

UEENEEG179A Develop detailed electrical drawings

Release: 2

INDUSTRY SKILLS COUNCILS
Creating Australia's Future

UEENEEG179A Develop detailed electrical drawings

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the production of detailed electrical drawings, drawing sets and documentation. It includes safe working practices; interpreting technical data and specifications; using advanced computer-aided systems and commands and appropriate drafting peripheral systems, equipment and tools to develop detailed drawings. It also includes applying knowledge of electrical equipment design drawing methods, techniques, procedures and protocols and documenting design, storing and retrieving data, and producing related documentation for presentation of preliminary and final drafts for verification.

Application of the Unit

Application of the Unit **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where

License to practice **3)**

applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEED104A	Use software for engineering applications
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE190A	Prepare engineering drawings using manual drafting and CAD for electrotechnology/utilities applications
UEENEEE191A	Prepare electrotechnology/utilities drawings using manual drafting and CAD equipment and software
UEENEEE192A	Produce detailed electrotechnology/utilities drawings using computer aided design equipment and software.

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading 4 Writing 4 Numeracy 4

Employability Skills Information

Employability Skills **5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to develop detailed electrical drawings	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed
	1.3	The need for detailed electrical drawings is determined

ELEMENT	PERFORMANCE CRITERIA	
		from the nature of the work to be undertaken.
	1.4	Established routines and procedures are followed to obtain electrical drawings details required for the work to be undertaken from project specifications.
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.6	Software tools and equipment a needed for the work are obtained in accordance with established procedures
2 Develop detailed electrical drawings	2.1	OHS risk control measures and procedures for carrying out the work are followed
	2.2	The types of design detailed electrical drawings and layouts required are determined from project specifications
	2.3	Technical data of electrical system components is interpreted to determine parameters that are to be included in the detailed electrical drawings
	2.4	Appropriate software tools are used to produce detailed electrical drawings based on standard protocols
	2.5	Detailed electrical drawings are checked for accuracy are compliance with project specifications
	2.6	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
3 Complete develop detailed electrical drawings documentation	3.1	Completed detailed electrical drawings are submitted to an appropriate person to be checked for accuracy and compliance with project specifications.
	3.2	Any alterations, additions or correction instructions are followed and detailed electrical drawings are re-submitted for final approval
	3.3	Copies of completed detailed electrical drawings are filed securely in accordance with established procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and develop detailed electrical drawings.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EG179A Electrical Detailed Drawings

Evidence shall show an understanding of electrical detailed drawings to an extent indicated by the following aspects:

T1 (Is the number correct?) Producing final drafts for verification encompassing:

- principles, purpose and concept of verification of drafting products encompassing: production of electrical drawings for verification by authorised persons, production of drawing sets, production of related documentation, presentations of final drafts
- processes and procedures related to the verification of final drafts by authorised persons encompassing: accuracy
- publication of verified electrical drawings

T2 Detailed electrical drawing production covering encompassing:

- distribution branch circuits and boards, services and load calculations; encompassing panels(HV/LV)/switch boards/motor control centres/final
- conductor/cable selection and calculations encompassing: electrical, data, communications
- overcurrent and overvoltage protection
- cable support systems; encompassing cable trays, trunking, conduits, ducts, guards, saddles, carriers, raceways/cavities, poles
- box and fitting fill requirements
- wiring devices and terminations
- distribution equipment; encompassing power circuit devices
- distribution system transformers; encompassing specialty transformers, power circuit devices
- lighting applications; encompassing lamps, ballasts, and components
- motors; encompassing functional controls, advanced motor controls, motor calculations, motor maintenance arrangements
- hazardous areas encompassing: electrical equipment; classification of
- emergency standby systems; encompassing UPS/inverter and battery banks
- fire alarm systems
- high-voltage terminations/splices
- cable size selection for installation cable run

REQUIRED SKILLS AND KNOWLEDGE

- cable sizes, voltage drops, conduit sizes, fault levels, fuse/circuit breaker (CB) sizes and working temperatures
- short circuit calculations
- earth loop impedance compliance test arrangements on the completed design
- touch potentials calculations
- cable schedules creation
- "single line" and "as built" drawings; encompassing three phase schematic colour diagrams, marked up cable calculations, short circuit results, earth loop impedance results
- quantities parts list and drawings for tender drawings issued by electrical consultants/engineers
- coordination and discrimination studies
- Building Management Systems (BMS) encompassing: building information modelling and sustainable design
- fuse and CB trip curves plots and displays
- troubleshooting/fault finding

T3 Schematic component commands detailed encompassing:

- schematic symbols editor
- schematic editor
- components from lists
- connectors
- terminals; encompassing multiple level and jumpers
- circuits
- multiple phase circuits

T4 Schematic editing encompassing:

- advanced utilities
- copy catalogue and location
- values
- swapping and updating blocks
- using the auditing tools
- update and retag drawings

T5 Detailed panel layouts encompassing:

- detailed panel layouts creation
- din rail tool
- terminal strip editor
- detailed panel layout annotation
- detailed reports

T6 Digitising and scanning encompassing:

- drawings digitisation; encompassing tablet and software configuration, tablet and

REQUIRED SKILLS AND KNOWLEDGE

puck, grids setup and alignment marks for various size drawings, software parameters setting, hard copy drawings digitisation to tablet parameters

- digitised drawing editor, manipulation and save
- digitise and grid setups and alignment marks on a hard copy of a large drawing (e.g. A1)
- scanning devices and peripherals setup encompassing associated software usage, save (e.g. file formats for use other software applications) and management
- drawing hard copy scan
- scanned image conversion to vector format, edit and save in file formats for use in CAD; encompassing importation of scanned images into CAD drawings in image formats for editing

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place,

access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or

licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Produce detailed electrical drawings as described in 8) Range and including:

A Producing a variety of detailed electrical drawings

B Producing drawing sets

C Producing drafting documentation

D Interpreting and using technical data and specifications

E Selecting components and materials

F Using advanced computer-aided systems and commands

G Using relevant drafting peripheral systems, equipment and tools to develop detailed drawings

H Digitising and scanning drafting/drawings products

I Applying knowledge of electrical equipment design drawing methods, techniques, procedures and protocols and documenting design

J Applying knowledge related to storing and retrieving data, and producing related documentation for presentations

K Presenting preliminary and final drafts for verification

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

OHS policy and work procedures and instructions.

Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to producing detailed electrical drawings

Method of assessment **9.4)**

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units **9.5)**

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with units covering the use of detailed electrical drawings

Range Statement

RANGE STATEMENT

10) 8This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing detailed electrical drawings:

- Covers detailed electrical drafting encompassing: circuit and wiring diagrams/schedules, block diagrams, schematics, panel/board layouts, assembly and installation drawings, modification drawings, and conversion between drawing types
- Australian/New Zealand standards and enterprise standards related to electrical drafting
- Components and materials from supplier/manufacturers' catalogues
- Detailed electrical drawings
- Drawing sets
- Drafting documentation
- Computer aided design systems, commands, drafting peripheral systems, equipment and tools
- Electrical equipment design drawing methods, techniques, procedures and protocols and documenting design
- Digitise and scan of drafting/drawing products
- Drafting data
- Storage and retrieval of drafting data
- Productions of related documentation for presentations
- Presentations
- Final drafts for verification

Organisational procedures for preparation and production of drawings, drawing sets, specifications, drafting documentation and operating and maintenance instructions/manuals for products and systems

Organisational procedures for processing, filing and saving all graphics, specifications, instructions and related documentation in correct format and location in accordance with work site procedures

Organisational procedures for collaborating with the client, key stakeholders and other staff in the selection of the preferred option

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrical