

**Domain****SOLAR INSTALLATION****Title:****Draw and interpret basic technical drawings****Level: 1****Credits: 5****Purpose**

This unit standard specifies the competencies required to draw and interpret basic technical drawings. It includes the following elements: Interpret circuits and symbols; Select purpose and features of electro technology diagrams; Draw electrical circuit diagrams for a given electrical product or equipment; Read and produce basic isometric drawings; Draw basic orthographic drawings in first angle and third angle projection; Read and produce different patterns. This unit standard is intended for those who work in a solar energy installation environment.

**Special Notes**

## 1. Entry information:

Prerequisite:

- *1641: Apply safety rules and regulations in a solar energy installation environment or demonstrated equivalent knowledge and skills.*

2. The assessment of this unit standard should concentrate not so much on draughtsmanship, but on the understanding of circuitry and the ability to use and sketch electrically and logically correct drawings.
3. This unit standard should be assessed in the context of plumbing operations and should be assessed in conjunction with other relevant technical unit standards selected from this domain.
4. To demonstrate competence, at a minimum, evidence is required of reading and interpreting electro technology circuits, comprising of a minimum of any four of the following circuit symbols: direct or alternating current, positive or negative voltage, power source, levers and buttons operated by pushing, switches operated by turning, boundary line, filament of a lamp, signal lamp, capacitor, transistor, diode, gauges, fuse or other circuit protection devices, heating element, solid-state circuits, variable and resistors.
5. Assessment evidence may be collected from a real workplace or an appropriate simulated realistic environment in which electro-technology and plumbing operations are carried out.
6. Glossary of terms:
  - 'SANS' refers to South Africa National Standards
  - 'IEC' refers to International Electro technical Commission
  - 'IEEE' refers to Institute of Electrical and Electronics Engineers.
7. Performance of all elements in this unit standard must comply with manufacturers' specifications, workplace specific requirements and reasonable flat rate time.

8. Regulations and legislation relevant to this unit standard include the following:
- Labour Amendment Act, 2012 (Act No. 2 of 2012)
  - Occupational Health and Safety Regulations No. 18, 1997.
  - SANS 10142-1 and SANS 10142-2 electrical wiring codes and all subsequent amendments to any of the above.

### **Quality Assurance Requirements**

This unit standard and others within this subfield may be awarded by institutions, which meet the accreditation requirements set by the Namibia Qualifications Authority and the Namibia Training Authority and which comply with the national assessment and moderation requirements. Details of specific accreditation requirements and the national assessment arrangements are available from the Namibia Qualifications Authority on [www.namqa.org](http://www.namqa.org) and the Namibia Training Authority on [www.nta.com.na](http://www.nta.com.na).

### **Elements and Performance Criteria**

#### **Element 1: Interpret circuits and symbols**

##### **Range:**

Electrical symbols may include but are not limited to symbols for connecting devices, contacts, normally-open and normally-closed push-buttons, circuit-breakers and contactors, relays meters and switches.

Devices and components may include but are not limited to cables, conductors connecting devices, resistors, inductors, capacitors; solenoid, coils, motors, motor windings, transformer windings, contacts, push-buttons, protective devices, lamps and displays, switches, fan, pump, mechanical drives and links and valves.

Control circuit terminologies may include but are not limited to normal position, de-energized (de-activated), energized position (activated), holding contacts, overload contacts, make contacts (normally open), break contacts (normally closed), manual, automatic and semi-automatic.

##### **Performance Criteria**

- 1.1 Electrical drawing symbols, components and sub-circuits are identified.
- 1.2 The use of letter codes in circuit diagram is identified and stated.
- 1.3 Different circuit diagrams and their features are distinguished.

#### **Element 2: Select purpose and features of electro technology diagrams**

##### **Performance Criteria**

- 2.1 Purpose and key features of schematic diagrams are identified in accordance with industry practice.
- 2.2 Purpose and key features of wiring diagrams are identified in accordance with industry practice.

- 2.3 Purpose and key features of block diagrams are identified in accordance with industry practice.
- 2.4 Purpose and key features of one-line diagrams are identified in accordance with industry practice.

### **Element 3: Draw electrical circuit diagrams for a given electrical product or equipment**

#### **Range:**

Electrical circuit diagrams may include but are not limited to location diagrams, one-line diagrams, schematic circuit diagrams, block diagrams and wiring diagrams. Product may be an electrical appliance and/or any process, machine and/or equipment featuring electrical control.

#### **Performance Criteria**

- 3.1 Circuit diagrams are drawn (to scale where necessary) using standard symbols.
- 3.2 Circuit diagram and wiring diagram configuration is explained.
- 3.3 Operation of circuits is explained logically with reference to current paths, purpose of each component, sub-circuit and the sequence of events for a full cycle of operation of the appliance.
- 3.4 Standard symbols are used and a legend of symbols is included, according to workplace procedures.
- 3.5 Equipment ratings and cable sizes are shown.

### **Element 4: Read and produce basic isometric drawings**

#### **Performance Criteria**

- 4.1 Isometric drawings are identified.
- 4.2 Symbols and abbreviations are used in line with standard drawing conventions.
- 4.3 Legend is constructed in line with standard drawing conventions.
- 4.4 Work pieces are drawn in isometric projection in line with standard drawing conventions.

### **Element 5: Draw basic orthographic drawings in first angle and third angle projection**

#### **Performance Criteria**

- 5.1 Basic orthographic drawings in first angle and third angle projection are identified.
- 5.2 Symbols and abbreviations are used in line with standard drawing conventions.
- 5.3 Legend is constructed in line with standard drawing conventions.
- 5.4 Solar components are drawn in orthographic projection in line with the conventions of first angle projection.

**Element 6: Read and produce different patterns**

**Range:**

Patterns include but are not limited to rectangular box, square pyramid, square to round pieces and cone.

**Performance Criteria**

- 6.1 Different patterns for different applications are identified.
- 6.2 Different patterns are developed in line with specifications and workplace requirements.

**Registration Data**

<b>Subfield:</b>	Electrical Engineering
<b>Date first registered:</b>	28 March 2018
<b>Date this version registered:</b>	28 March 2018
<b>Anticipated review:</b>	2023
<b>Body responsible for review:</b>	Namibia Training Authority