	Unit ID: 870
Domain	**ELECTROTECHNOLOGY**
Title:	**Apply knowledge of basic circuit protection devices**
Level: 2	**Credits: 3**

Purpose

This unit standard specifies the competencies required to apply knowledge of circuit protection and protective devices. It includes knowledge of circuit protection terms and principles, circuit protective devices, residual current devices (RCDs), competencies to select circuit protective devices for electrical and related applications and replace protective devices. This unit standard is intended for those who work in electrical and related workplace environment.

Special Notes

1. Entry information:

   Prerequisite
   - Unit 864 - *Apply safety rules and regulations in an electrotechnology environment* or demonstrated equivalent knowledge and skills.

2. Assessment evidence may be collected from a real workplace or a simulated real workplace or an appropriate simulated realistic environment in which electrical operations are carried out.

3. All inspections, tests, service and maintenance entailed in this unit standard must comply with statutory requirements and manufacturers' and/or company's guidelines and instructions.

4. Glossary of terms:
   - *'specifications'* refers to any, or all of the following: manufacturers' specifications and recommendations, workplace specific requirements.
   - *'SANS'* refers to South Africa National Standards

5. Regulations and legislation relevant to this unit standard include the following:
   - Labour Act, No. 11, 2007.
   - Occupational Health and Safety Regulations No. 18, 1997 and all subsequent amendments.
   - SANS 10142-1.
   - SANS 10142-2.

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 and the Namibia Training Authority. All approved unit standards, qualifications and national assessment arrangements are available on the Namibia Training Authority website www.nta.com.na.

Elements and Performance Criteria

Element 1: Demonstrate knowledge of circuit protection principles.

Range

Terms related to circuit protection may include but not limited to rated current, voltage rating, fusing current (fusing factor, tripping factor), utilization category, classes of fuses and circuit breakers, cut-off characteristic, time vs. current characteristic, category of duty, discrimination, back-up protection, rupturing capacity (breaking capacity), prospective short-circuit current (PSCC), coarse excess-current protection, close excess-current protection, sensitivity.

Possible electrical faults may include but are not limited to leakage current, over current and short circuit.

Effects of electrical faults may include but are not limited to electromechanical energy effects, heat energy effects, damaged cables and equipment, fire, explosion and electric shock.

Performance Criteria

1.1 Terms related to circuit protection are explained in accordance with industry practice.

1.2 Circumstances leading to excessive current in an electrical circuit are identified.

1.3 Relationship between fusing or tripping current, current rating, and fusing or tripping factor for a protective device is stated.

1.4 Merits of providing close excess-current protection are explained according to current regulations and standards.

1.5 The effects of electrical faults are described in terms of the danger to people, animals and property.

1.6 The need for rapid disconnection of faulty circuits is explained.

Element 2: Demonstrate knowledge of basic circuit protective devices.

Range

Basic circuit protective devices may include but is not limited to fuses, circuit-breakers, relays and isolation transformers.

Typical poor selection of devices may take form of but not limited to underrating, overrating, incorrect utilization category, incorrect classes of fuses and circuit breakers, fusing or tripping factor and rupturing capacity.

Fault conditions may include but are not limited to overload, short-circuit, earth leakage fault, mechanical overload, phase failure in a motor and excessive earth leakage.

Performance Criteria

2.1 Protection devices are described with the aid of diagrams and reference to construction and operating principles.

2.2 Fuse cartridge type and size are identified from physical or graphical representations of cartridge markings.

2.3 Protective devices are classified according to their ability to provide either coarse or close excess-current protection.

2.4 Time versus current curves of re-wirable fuses, High Rupture Capacity (HRC) fuses, and miniature circuit breakers are compared in terms of speed of operation and accuracy of calibration.

2.5 The effects of poor selection of protective devices are described for different fault conditions.

2.6 A three-phase protective device is described with reference to construction, operating principle, and protection afforded additional to that of single-phasing of a circuit.

2.7 Practical demonstrations are given of resetting or reloading protective devices, in accordance with industry practice and safety procedures.

Element 3: Demonstrate knowledge of residual current devices (RCDs).

Range

RCDs are to include earth-leakage circuit-breaker (ELCB), residual current-operated circuit breaker (RCCB), residual current-operated circuit breaker with over-current protection (RCBO) and ground-fault interrupter (GFI).

Precautions are to include but not limited to warning labels, disconnection of RCD when using a high voltage tester and accidental tripping of RCD when testing other parts of the circuit.

Performance Criteria

3.1 RCD terms are explained according to current regulations, standards and/or industry practice.

3.2 An RCD is described with reference to construction and principle of operation.

3.3 Procedures for testing the operation of RCDs are described according to current regulations and standards.

3.4 Precautions to be taken when testing circuits containing RCDs are described.

3.5 Situations requiring RCD protection are stated according to current regulations and standards.

Element 4: Select circuit protective devices for electrical applications.

Range

Electrical applications are to include general applications and three-phase motor applications.

General applications may include but are not limited to sub main, sub circuit wiring, electrical accessories, three-phase and single-phase appliances and outdoor appliance.

Three-phase motor applications may include but not limited to overload, short circuit, locked rotor, phase failure and phase reversal.

Performance Criteria

4.1 The current rating of the device is identified from examination of markings and/or manufacturers' data

4.2 Protective devices are selected to meet the application requirements in terms of electrical protection characteristic, speed of operation, reset method, and current regulations and standards.

4.3 Relative merits of devices are stated and compared where more than one device meets the application requirements.

Element 5: Replace defective protective devices.

Performance Criteria

5.1 Defective appliance is disconnected and main switch turned off before removal of the device according to lockout procedures.

5.2 The defective device is removed, cleaned and read to obtain current ratings and device characteristics.

5.3 The current rating, characteristics and size and/or base are matched and the device is replaced and/or repaired according to industry practice.

5.4 After reinsertion, the device is fully seated in its base and free of protruding ends.

5.5 Re-set is done in accordance with industry practice.

Registration Data

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