Unit ID: 584

Domain **AIR CONDITIONING AND REFRIGERATION**

Title: **Apply knowledge of electrical and electronics principles in air conditioning and refrigeration**

Level: 2 **Credits: 6**

Purpose

This unit standard specifies the competencies required to apply knowledge of electrical and electronics principles in air conditioning and refrigeration. It includes demonstrate and apply knowledge of the function and performance of electrical and electronic component in air conditioning and refrigeration systems , demonstrate knowledge of electrical principles, calculate values of power, given any two of voltage, current, or resistance values and identify causes of electrical and/or electronic problems in ACR systems. This unit standard is intended for those who work as air conditioning and refrigeration mechanics.

Special Notes

1. Entry information:

   Prerequisite
   - Unit 567 - *Apply health and safety routines in an air conditioning and refrigeration workplace* 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 air conditioning and refrigeration operations are carried out.

3. All inspection, operation and maintenance procedures associated with the use of tools and equipment shall comply with manufacturers' specifications and/or company's guidelines and instructions.

4. Glossary of terms:
   - 'ACR system' refers to air conditioning and refrigeration systems
   - 'specifications' refers to any, or all of the following: manufacturers' specifications and recommendations, workplace specific requirements.

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.

6. Performance of all elements in this unit standard must comply with industry standards.

7. This unit standard applies to single-phase and three-phase air conditioning and refrigeration systems.

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: Plan and prepare for work.

Performance Criteria

1.1 Work instructions, including job cards, specifications and operational details are obtained, confirmed and applied.

1.2 Workplace inspection, equipment defect identification, assessment of conditions and hazards and determination of work requirements is carried out.

1.3 Safety requirements are followed in line with safety plans and policies.

1.4 Tools and equipment selected to carry out tasks are consistent with the requirements of the job, checked for serviceability and any faults rectified or reported prior to commencement.

1.5 Material requirements are identified and obtained in line with job card and/or specifications.

1.6 Materials are safely handled and located ready for use in line with workplace procedures.

1.7 Technical and/or calibration requirements for tools and equipment are sourced and implemented in line with workplace procedures.

1.8 Environmental protection requirements are identified and applied in line with environmental plans and regulatory obligations.

Element 2: Demonstrate and apply knowledge of the function and performance of electrical and electronic component in air conditioning and refrigeration systems.

Range

Components may include but are not limited to electrical components such as motors, relays, protective devices such as fuses, circuit breakers, contactors, overload; properties such as voltage, current, resistance, power and electronic components such as resistors, capacitors, diodes, transistors and thermostats.

Performance Criteria

2.1 Electrical and electronic components operation and functions are explained and their applications are stated.

2.2 Electric motors performance is assessed in terms of speed, torgue, energy conversion efficiency and in line with manufacturer's and workplace procedures.

2.3 Speed control of alternating current (AC) and direct current (DC) is explained in terms of electrical principles.

Element 3: Demonstrate knowledge of electrical principles.

Range

Electrical principles may include but are not limited to atomic structures, current electricity, electrical units, resistance, ohms law, electric power, alternating current and voltage, and electromagnetism.

Circuits assembly may include but are not limited to drawing a diagram; this includes create series, parallel and series-parallel circuits using resistors, and calculate voltage and current distribution.

Performance Criteria

3.1 Types of resistors used for electronic circuits are identified from manufacturers' manuals and catalogues.

3.2 Operational characteristics of each of the range of resistors are explained according to manufacturers' specifications.

3.3 Circuits are physically assembled with three resistors and with four resistors.

3.4 The voltage across each resistor is calculated and measured.

3.5 The current through each resistor is calculated and measured.

Element 4: Calculate values of power, given any two of voltage, current, or resistance values.

Range

Values of power are limited to series circuits, parallel circuits, and series-parallel circuits.

Answers expressed using the correct multiples are limited to mega, kilo, milli, and micro.

Performance Criteria

4.1 Formulas chosen are correct for the values given.

4.2 Answers are expressed using correct multiples and sub-multiples of the unit.

Element 5: Identify causes of electrical and/or electronic problems in ACR systems.

Range

Components may include but are not limited to electric motors and power supplies and measuring instruments such as voltmeter, ammeters, ohmmeters and wattmeters.

Performance Criteria

5.1 Procedures and information required for identifying causes of problems in ACR systems are identified and sourced in line with workplace procedures.

5.2 Cause of problems in the system is identified using suitable measuring instruments in line with workplace procedures.

Element 6: Complete work and clean up.

Range

Work completion details may include but are not limited to job card, sign-out form for equipment, and maintenance form.

Performance Criteria

6.1 Work is completed and appropriate personnel notified in line with workplace procedures.

6.2 Work area is cleared of waste, cleaned, restored and secured in line with workplace procedures.

6.3 Reusable material is collected and stored in line with workplace procedures.

6.4 Equipment used is cleaned, checked, maintained and stored in line with workplace procedures.

6.5 Work completion details are finalised in line with workplace procedures.

Registration Data

Subfield:	Mechanical Engineering
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