

Unit ID: 1706

Domain

**AIR CONDITIONING AND  
REFRIGERATION**

Title:

**Demonstrate knowledge on  
fundamentals of physics related to Air  
Conditioning and Refrigeration**

Level: 1

Credits: 6

**Purpose**

This unit standard specifies the competencies required to demonstrate knowledge on fundamentals of physics related to air conditioning and refrigeration. It includes planning and prepare for work; demonstrating basic knowledge of base and derived units used in the SI system of measurement applicable to air conditioning and refrigeration, describing principles of heat and refrigeration, demonstrating knowledge of the principle of liquids and vapours in refrigeration and air conditioning environment, as well as complete work and do housekeeping. This unit standard is intended for those who work as Air conditioning and Refrigeration artisans.

**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:

- '*specifications*' refers to any, or all of the following: manufacturers' specifications and recommendations, workplace specific requirements
- '*PH chart*' refers to pressure enthalpy chart. The PH chart is an important tool used to describe the property changes that take place during each phase of the refrigeration cycle and provides a graphical means of study
- '*SI units*' refers to metric systems used in Namibia based on the International System of Units
- '*calculation*' means determining the dimensions, quality or capacity of an object by applying mathematical methods.

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
- Occupational Health and Safety Regulations No. 101, 1992 (act 6,1992) 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](http://www.nta.com.na).

### **Elements and Performance Criteria**

#### **Element 1: Demonstrate basic knowledge of base and derived units used in the SI system of measurement applicable to air conditioning and refrigeration.**

##### **Range**

Base and derived units may include but are not limited to metre, kilogram, second, ampere, Kelvin and/or Celsius, Newton, joule, Pascal, watt, volt, ohm and hertz.

Conversion of common metric base and derived units to imperial units and vice versa may include but are not limited to length, mass, area, volume, volume liquids, speed, force, torque, pressure energy, vacuum, power and temperature.

##### **Performance Criteria**

- 1.1 Information required for base and derived units' calculations are identified.
- 1.2 The meaning of base and derived units is explained.
- 1.3 Appropriate calculation method to convert base and derived units to imperial units and vice versa is selected and applied.
- 1.4 Results of calculations are confirmed and recorded.

#### **Element 2: Describe principles of heat and refrigeration.**

##### **Range**

Principles of heat and refrigeration may include but are not limited to the basics of heat theory such as state of matter, unit of heat, heat transfer, specific, sensible and latent heat, pressure, atmospheric pressure, vaporisation, condensation and laws of thermodynamics.

Methods of heat transfer are limited to conduction, convection and radiation.

##### **Performance Criteria**

- 2.1 Principles of heat and refrigeration are determined and explained.
- 2.2 The three methods of heat transfer are explained with reference to their applications in air conditioning and refrigeration.
- 2.3 The term saturation, latent heat of fusion, latent heat of evaporation, specific heat, relative humidity, and dry and wet bulb temperature are defined as used in air conditioning and refrigeration.
- 2.4 Laws of thermodynamic are described.
- 2.5 Appropriate calculation methods to calculate heat are selected and applied.
- 2.6 Results of calculations are confirmed and recorded.
- 2.7 The SI units for temperature and pressure are stated together with symbols.
- 2.8 The term specific volume, specific density, and specific gravity are explained, and their SI units including symbols are stated.

**Element 3: Demonstrate knowledge of the principle of liquids and vapours in refrigeration and air conditioning environment**

**Range**

Principles may include but are not limited to temperature; scales measurement instruments and pressure; gas laws, pressure measurement instruments.

Refrigerant conditions may include but are not limited to saturation, saturated liquid, saturated vapour, superheated vapour and sub cooled liquid.

**Performance Criteria**

- 3.1 Temperature and pressure are defined.
- 3.2 Measurement instruments are identified and uses are stated.
- 3.3 Gas laws are listed and described.
- 3.4 Refrigerant conditions are stated and described in relation to vapour compression cycle.
- 3.5 Pressure/enthalpy diagram is drawn; plot and pressure/enthalpy chart lines are described.
- 3.6 Differences between saturation, saturated liquid, saturated vapour, superheated vapour and sub cooled liquid are described.

## **Registration Data**

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