Title	**Demonstrate knowledge of air conditioning systems principles, applications and hazards**		
Level	**3**	**Credits**	**10**

Purpose	People credited with this unit standard are able to: describe hazards and methods to manage risks when handling refrigerants; demonstrate knowledge of electrical hazards and limits of electrical work relevant to air conditioning systems; demonstrate knowledge of types of air conditioning systems; describe air conditioning principles as they relate to human comfort; and demonstrate knowledge of air conditioning principles as they relate to energy efficiency.

Classification	Mechanical Engineering > Refrigeration and Air Conditioning

Available grade	Achieved

Guidance Information

1 Legislation and standards relevant to this unit standard:
Building Act 2004;
Climate Change Response Act 2002;
Electricity Act 1992;
Electricity Amendment Act 1997;
Electricity (Safety) Regulations 2010;
Hazardous Substances and New Organisms Amendment Act 2015;
Health and Safety at Work Act 2015;
Ozone Layer Protection Act 1996;
AS/NZS 5149:2016, *Refrigerating systems and heat pumps parts 1:5 Refrigerating systems and heat pumps – Safety and environmental requirements*;
AS/NZS ISO 817:2016, *Refrigerants – Designation and safety classification*;
AS/NZS 3000:2018, *Electrical installations (known as the Australian/New Zealand Wiring Rules)*;
and any subsequent amendments.

2 References
Althouse, Turnquist, Bracciano. *Modern Refrigeration and Air Conditioning*. 21st edition. Tinley Park, Illinois: The Goodhouse-Willcox Company Inc. ISBN 1-63563-877-1.
Institute of Refrigeration, Heating and Air Conditioning Engineers of New Zealand (IRHACE New Zealand). 2001 *Code of Practice for the reduction of emissions of fluorocarbon refrigerants in refrigeration and air conditioning applications*. Available from IRHACE, http://www.irhace.org.nz/.

3 Definitions

Air conditioning systems refer to systems that provide heating, cooling and suitable indoor air quality for use in residential or light commercial applications.
Approved industry practices refer to approved codes of practice and standardised procedures accepted by the wider refrigeration and air conditioning industry sectors as examples of best practice.
VRF refers to variable refrigerant flow.
Worksite procedures refer to documented procedures used by the organisation carrying out the work and applicable to the tasks being carried out. They may include but are not limited to – standard operating procedures, site safety procedures, equipment operating procedures, codes of practice, quality assurance procedures, housekeeping standards, procedures to comply with legislative and local body requirements.

4 Assessment information

All activities and evidence must be in accordance with worksite procedures and approved industry practices.

Outcomes and performance criteria

Outcome 1

Describe hazards and methods to manage risks when handling refrigerants.

Performance criteria

1.1 Hazards associated with the handling of refrigerants are described.

Range flammability, toxicity, asphyxiation, ozone depletion effects, over-pressurisation.

1.2 Methods of managing refrigerant risks are described.

Range avoidance of leakage, ventilation, first aid measures, retention and disposal of recovered refrigerant.

Outcome 2

Demonstrate knowledge of electrical hazards and limits of electrical work relevant to air conditioning systems.

Performance criteria

2.1 Electrical hazards are described in terms of potential effects on personnel, plant, and equipment.

2.2 Range of electrical work permissible for holders of different electrical licences are identified.

Range licences – unlicensed electrical workers, Electrical Service Technicians (EST).

Outcome 3

Demonstrate knowledge of types of air conditioning systems.

Range types – high-wall, under-ceiling, cassette, floor console, VRF, ducted, packaged units, multi systems.

Performance criteria

3.1 System components of each type are identified and their functions are described.

3.2 Compressors of each type are identified and their differences are explained.

3.3 Electrical components and controls of each type are identified and their functions are described.

3.4 Control systems of each type are described in terms of their purpose and application.

Outcome 4

Describe air conditioning principles as they relate to human comfort.

Performance criteria

4.1 The effects of air movement and environments on human comfort are described.

4.2 Relationship between radiant energy and air temperature is described.

4.3 Effects of air stratification and equipment location are described.

4.4 Effects of low and high humidity are described.

Outcome 5

Demonstrate knowledge of air conditioning principles as they relate to energy efficiency.

Performance criteria

5.1 The effects on efficiency of an incorrectly powered (kilowatt) air conditioning unit are described.

5.2 Heat recovery for ventilation system efficiency is described.

5.3 Energy efficiency features are described.

5.4 Maintenance checks to maintain energy efficiency are explained.

Replacement information	This unit standard replaced unit standard 22441.

Planned review date	31 December 2026

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	26 August 2021	N/A

Consent and Moderation Requirements (CMR) reference	0013

This CMR can be accessed at http://www.nzqa.govt.nz/framework/search/index.do.

Comments on this unit standard

Please contact Competenz qualifications@competenz.org.nz if you wish to suggest changes to the content of this unit standard.