

Title	Demonstrate knowledge of design principles for commercial RAC systems		
Level	4	Credits	5

Purpose	<p>This unit standard is for people undergoing training to tradesperson level in the refrigeration and air conditioning (RAC) industry. It covers the underpinning knowledge required to size and select components to make up a basic RAC system for a specific purpose.</p> <p>People credited with this unit standard are able to: describe the factors that affect RAC system design; and explain RAC design principles.</p>
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Classification	Mechanical Engineering > Refrigeration and Air Conditioning
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Available grade	Achieved
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Guidance Information

- 1 Recommended skills and knowledge:
 Unit 28952, *Demonstrate knowledge of refrigerants and their management*;
 Unit 28970, *Demonstrate knowledge of the principles of refrigeration and air conditioning*;
 Unit 28961, *Demonstrate knowledge of electrical and electronic components used in commercial RAC systems*.
- 2 Legislation and standards
 Health and Safety at Work Act 2015;
 Building Act 2004;
 Electricity (Safety) Regulations 2010;
 Electricity Act 1992;
 Ozone Layer Protection Act 1996;
 AS/NZS 5149:2016 *Parts 1:5 Refrigerating Systems and Heat pumps – Safety and environment requirements*;
 AS/NZS 817:2016 *Refrigerants – Designation and safety classification*;
 AS/NZS 3000:2007 *Electrical installations (known as the Australian/New Zealand Wiring Rules)*;
 and any subsequent amendments.
- 3 References
 Althouse, Turnquist, Bracciano. *Modern Refrigeration and Air Conditioning*. 19th edition. Tinley Park, Illinois: The Goodhouse-Willcox Company Inc. ISBN 1-59070-280-8.

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/>.

4 Definitions

AC refers to alternating current.

Commercial RAC systems refer to refrigeration systems found in: retail food outlets, truck and shipping containers, horticultural cool rooms, controlled atmosphere food stores; and air conditioning equipment used in commercial buildings.

DC refers to direct current.

PLC refer to programmable logic controller.

5 Assessment information

The design principles that this unit standard covers are those that would be used to size and select components for a basic commercial RAC system such as a small cool room or split air conditioning system.

Outcomes and performance criteria

Outcome 1

Describe the factors that affect RAC system design.

Performance criteria

1.1 Typical customer requirements are described in terms of their effect on system design.

Range may include but is not limited to – product to be stored, required temperature, required humidity, volume of space to be controlled, location and situation of space to be controlled, required air quality, design of cabinet, frequency of door operations, available budget, when required.

1.2 Site characteristics that affect system design are described in terms of their effect on system design.

Range ambient air quality, ambient air temperature, available electrical power, available space, available mounting facilities, seismic requirements.

1.3 Legislation applicable to the system and/or its operation is identified and its effect explained.

Outcome 2

Explain RAC design principles.

Performance criteria

- 2.1 The term *heat load* is explained in terms of contributing factors and units of measure.
- 2.2 The principles of air control are described in terms of RAC systems and components.
- Range temperature, humidity, volume, flow;
air quality – airborne particles, bacteria, odours.
- 2.3 The principles of electrical power supply are described in terms of their characteristics and application in RAC systems.
- Range DC, AC, single phase, three phase, system input requirement.
- 2.4 The principles of electrical and electronic components are described in terms of operation and use in RAC systems.
- Range motors, switches, overload protection devices, timers, sensors, PLC devices, manual controls.
- 2.5 Mechanical components are described in terms of their functions and operating principles.
- Range primary components, secondary components, structure, panelling, insulation, piping, seismic restraints.
- 2.6 The characteristics of refrigerants and lubricating oils are described in terms of their performance characteristics and application in RAC systems.
- 2.7 The combination and interrelationship of components are described in terms of their effect on system performance and cost.
- Range mechanical components, electrical components, structural components, refrigerants, insulation, piping, energy efficiency.

Replacement information	This unit standard and unit standard 28966 replaced unit standard 22705.
Planned review date	31 December 2020

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	18 June 2015	N/A
Revision	2	22 October 2020	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.