Title	**Maintain industrial refrigeration systems**		
Level	**4**	**Credits**	**20**

Purpose	This unit standard is for people who work in the refrigeration and air conditioning sector of the engineering industry. People credited with this unit standard are able to, for industrial refrigeration systems: review maintenance information; maintain the integrity of lubrication, refrigerant, and air distribution systems, and secondary heat transfer liquids; maintain the integrity of mechanical components, thermal insulation, heat transfer componentry, defrost systems, and condensate drainage; calibrate and test control and reporting systems; check and maintain electrical components; and complete maintenance activities and documentation, and initiate follow-up actions.

Classification	Mechanical Engineering > Refrigeration and Air Conditioning

Available grade	Achieved

Prerequisites	People undergoing training and assessment towards the competencies in this unit standard must be licensed by the Electrical Workers Registration Board as Electrical Service Technician.

Guidance Information

1 Recommended skills and knowledge:
Unit 28960, *Demonstrate knowledge of commercial RAC system maintenance and servicing*;
Unit 28965, *Maintain and service commercial RAC systems and equipment under supervision*.

2 Legislation and standards
Health and Safety at Work Act 2015;
Building Act 2004;
Climate Change Response Act 2002;
Electricity (Safety) Regulations 2010;
Electricity Act 1992;
Electricity Amendment Act 1997;
Hazardous Substances and New Organisms Amendment Act 2015;
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 All worksite practices must meet recognised codes of practice and documented safety procedures and safety plans (where these exceed the code) for personal and worksite safety, and obligations required under current legislation.

5 Definitions
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.
EWRB refers to the Electrical Workers Registration Board.
Industrial refrigeration systems refer to items such as: single or multi-staged refrigeration systems (typically using ammonia refrigerant) used in the manufacturing process in areas such as freezing works, breweries, and chemical plants.
Power train equipment – items such as: switches, fuses, contactors, relays, timers, overloads, soft-starts, variable speed drives (VSDs), microprocessors, and data loggers.
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.

6 Assessment information
This unit standard may be assessed in the workplace using naturally occurring evidence or in a simulated environment that demands performance equivalent to that required in the workplace.

Outcomes and performance criteria

Outcome 1

Review maintenance information for industrial refrigeration systems.

Performance criteria

1.1 Maintenance information and/or schedules are obtained that are in accordance with operational requirements and the characteristics of plants.

1.2 Maintenance information and/or schedules are reviewed and revised as required to accommodate changes in plant characteristics or changes in operational or regulatory requirements.

1.3 Timeframes for maintenance are established and agreed with stakeholders in accordance with approved industry practice.

Range stakeholders may include but are not limited to – manager, supervisor, contract manager, contractor, internal staff.

Outcome 2

Maintain the integrity of lubrication systems in industrial refrigeration systems.

Performance criteria

2.1 Lubrication system variables and components are checked and adjusted as required to meet operational specifications.

2.2 Oil levels and circulation balances are checked and adjusted as required to meet operational specifications.

2.3 Oil leaks are detected and rectified to ensure operational integrity.

2.4 Oil properties and conditions are tested and adjusted as required to meet operational specifications.

2.5 Additional follow-up action that is required is arranged in accordance with worksite procedures.

Outcome 3

Maintain the integrity of refrigerant systems in industrial refrigeration systems.

Performance criteria

3.1 Pressure drops across strainers, filters, and filter driers are checked and recorded.

3.2 Refrigerant leaks are detected and rectified to ensure operational integrity.

3.3 Refrigerant system variables are checked and adjusted as required to meet operational specifications.

3.4 System contaminants are detected and removed to ensure operational integrity.

3.5 Where connected, automatic air purgers are checked and adjusted as necessary to meet operational specifications.

3.6 Where automatic air purgers are not connected, an appropriate manual method is used to diagnose non-condensable gases.

3.7 Safety relief valves are checked and maintained in accordance with operational specifications.

3.8 Additional follow-up action that is required is arranged in accordance with worksite procedures.

Outcome 4

Maintain the integrity of secondary heat transfer liquids in industrial refrigeration systems.

Performance criteria

4.1 Liquid properties are adjusted as required to meet specified standards in accordance with worksite procedures.

Range may include but is not limited to – flushing, additives, treatments.

4.2 Surfaces within cooling towers and evaporative condensers are cleaned and sanitised to meet regulatory requirements.

4.3 The condition of components in cooling towers and evaporative condensers is checked and compliance with specified standards is confirmed in accordance with worksite procedures.

4.4 Additional follow-up action that is required is arranged in accordance with worksite procedures.

Outcome 5

Maintain the integrity of air distribution systems in industrial refrigeration systems.

Performance criteria

5.1 Air distribution system components are checked and adjusted as required to meet operational and regulatory requirements.

5.2 If fitted, fire damper operation is checked and adjusted as required to meet operational and regulatory requirements.

5.3 Condensate trays and drains are checked, cleaned, and sanitised to meet operational and regulatory requirements.

5.4 Air filtration equipment is checked, cleaned, and sanitised to meet operational and regulatory requirements.

5.5 Coil faces, any ducting, fixings, and connections are checked, cleaned, and sanitised as required to meet operational and regulatory requirements.

5.6 Additional follow-up action that is required is arranged in accordance with worksite procedures.

Outcome 6

Maintain the integrity of mechanical components, thermal insulation, heat transfer componentry, defrost systems, and condensate drainage in industrial refrigeration systems.

Performance criteria

6.1 Power train equipment, safety guards, fans, pumps, compressors, hoses, supports, structures, seismic restraints, and enclosures are checked and maintained to ensure compliance with operational and regulatory requirements.

6.2 Insulation and vapour barrier integrity on piping, any ducting, pressure vessels, and cool-room panels is checked and maintained to ensure compliance with operational and regulatory requirements.

6.3 Cool-room doors, door hinges, door safety release mechanisms, bi-flow relief ports, and door curtains are checked and maintained to ensure compliance with operational and regulatory requirements.

6.4 The efficiency of heat exchangers is checked and maintained to ensure compliance with operational and regulatory requirements.

6.5 Where applicable, heat exchangers are protected by selecting and applying surface coatings, selecting and attaching sacrificial anodes, or by using other industry recognised methods.

6.6 Defrost systems are checked and maintained to meet operational and regulatory requirements.

Range defrost systems may include but are not limited to – electrical, hot gas, air, reverse cycle, water.

6.7 Additional follow-up action that is required is arranged in accordance with worksite procedures.

Outcome 7

Calibrate and test control and reporting systems in industrial refrigeration systems.

Performance criteria

7.1 The operation of controls is checked, and controls are adjusted as required to meet system specifications.

7.2 Monitors and reporting systems are checked, recalibrated and/or adjusted as required to meet system specifications.

7.3 Additional follow-up action that is required is arranged in accordance with worksite procedures.

Outcome 8

Check and maintain electrical components in industrial refrigeration systems.

Performance criteria

8.1 Electrical circuits are tested, and currents, voltages, and insulation resistances are measured and recorded.

8.2 Test and measurement results are compared with standards and/or ratings, and faults are identified.

8.3 Power train equipment is checked and maintained to meet operational requirements.

8.4 Additional follow-up action that is required is arranged in accordance with worksite procedures.

Outcome 9

Complete maintenance activities and documentation, and initiate follow-up actions.

Performance criteria

9.1 Maintenance activities are completed in accordance with agreed timeframes.

9.2 Where applicable, the integrity of building penetrations is confirmed by appropriate visual and tactile checks.

9.3 All operating conditions, adjustments made, and maintenance completed are recorded in maintenance reports in accordance with worksite procedures.

9.4 Requests and work orders for needed follow-up action are prepared in accordance with worksite procedures.

9.5 Job content, materials used, and labour inputs are described for both invoicing purposes and customer reports in accordance with worksite procedures.

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	9 April 1995	31 December 2017
Revision	2	14 April 1997	31 December 2017
Revision	3	5 January 1999	31 December 2017
Revision	4	13 November 2001	31 December 2017
Review	5	20 June 2006	31 December 2019
Review	6	18 June 2015	31 December 2020
Revision	7	16 February 2017	N/A
Revision	8	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