22329VIC
Course in Heating, Ventilation and Air Conditioning Services

This course has been accredited under Part 4.4 of the Education and Training Reform Act 2006

Version 3

Accredited for the period: 1 July 2017 to 30 June 2023

THE EDUCATION STATE
VICTORIA State Government | Education and Training

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Version History		
Version	Date	Comment
# 1	1 July 2017	Initial release
# 2	1 September 2018	The addition of unit VU22583 - Handle Class A2/A2L Flammable Refrigerants
#3	30 June 2022	Accreditation period extended to **30 June 2023**

Contents

Section A: Copyright and course classification information 1
1.Copyright owner of the course 1
2. Address 1
3. Type of submission 1
4. Copyright acknowledgement 1
5. Licensing and franchise 2
6. Course accrediting body 2
7. AVETMISS information 2
8. Period of accreditation 2
Section B: Course information 3
1. Nomenclature 3
1.1 Name of the qualification 3
1.2 Nominal duration of the course 3
2.Vocational or educational outcomes 3
2.1 Purpose of the course 3
3. Development of the course 3
3.1 Industry /enterprise/ community needs 3
3.2 Review for re-accreditation 4
4. Course outcomes 5
4.1 Qualification level 5
4.2 Employability skills 5
4.3 Recognition given to the course 5
4.4 Licensing/ regulatory requirements 6
5. Course rules 6
5.1 Course structure 6
5.2 Entry requirements 7
6. Assessment 7
6.2 Assessor competencies 8
7. Delivery 9
7.1 Delivery modes 9
7.2 Resources 10
8. Pathways and articulation 10
9. Ongoing monitoring and evaluation 11
Section C: Units of competency 12
VU21958 Advise clients on heating, ventilation and air conditioning services 13
VU21959 Maintain control devices and systems 16
VU21960 Maintain essential safety measures 21
VU22583 Handle Class A2/A2L Flammable Refrigerants 27

Section A: Copyright and course classification information

1. Copyright owner of the course	Copyright of this course is held by the Department of Education and Training, Victoria © State of Victoria (Department of Education and Training) 2017
2. Address	Executive Director Higher Education and Workforce Development Higher Education and Skills Department of Education and Training (DET) GPO Box 4367 MELBOURNE VIC 3001 **Organisational Contact:** Manager, Training and Learning Products Unit Higher Education and Workforce Development Higher Education and Skills Telephone: 131823 Email: course.enquiry@education.vic.gov.au **Day-to-Day Contact:** Curriculum Maintenance Manager-Engineering Industries Box Hill Institute of TAFE Private Bag 2014 Box Hill, Victoria 3128 Ph: 03 92286 9880 Email: gadda@bhtafe.edu.au
3. Type of submission	Re-accreditation.
4. Copyright acknowledgement	Copyright of this material is reserved to the Crown in the right of the State of Victoria. © State of Victoria (Department of Education and Training) 2017. The units of competency: • UEENEEJ174A Apply safety awareness and legal requirements for hydrocarbon refrigerants • UEENEEJ175A Service and repair self contained hydrocarbon air conditioning and refrigeration systems • UEENEEJ184A Apply safety awareness and legal requirements for carbon dioxide refrigerant • UEENEEJ185A Repair and service carbon dioxide refrigeration systems

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	are from the UEE11 Electrotechnology Training Package administered by the Commonwealth of Australia. © Commonwealth of Australia The unit of competency: • MSMENV272 Participate in environmentally sustainable work practices is from the MSM Manufacturing Training Package administered by the Commonwealth of Australia. © Commonwealth of Australia
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6. Course accrediting body	Victorian Registration and Qualifications Authority (VRQA) Website link here.
7. AVETMISS information	**ANZSCO code** 342111 Airconditioning and Refrigeration Mechanic **ASCED Code:** 0313 Electrical and Electronic Engineering and Technology ***National course code*** 22329VIC
8. Period of accreditation	1 July 2017 – 30 June 2023

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Section B: Course information

1. Nomenclature	***Standard 1 AQTF Standards for Accredited Courses***
1.1 Name of the qualification	Course in Heating, Ventilation and Air Conditioning Services
1.2 Nominal duration of the course	14 – 44 hours
2.Vocational or educational outcomes	***Standard 1 AQTF Standards for Accredited Courses***
2.1 Purpose of the course	This post-trade course provides the knowledge and skills required to service heating, ventilation and air conditioning (HVAC) equipment and includes the essential safety measures and control systems. The course also covers the application of relevant codes of practice and standards in the inspection and testing of HVAC systems and includes smoke and fire control features of air handling systems, optimising indoor air quality and enhancing energy efficiency.
3. Development of the course	***Standards 1and 2 AQTF Standards for Accredited Courses***
3.1 Industry /enterprise/ community needs	The Air Conditioning and Mechanical Contractors Association (AMCA) approached Box Hill TAFE in 2009 to establish a specialist training centre to cater for refrigeration and air conditioning qualifications. The subsequent research project validated the need for the centre but also provided information on the current and emerging training needs of the industry. Based on the research, the AMCA and Box Hill TAFE developed the 22201VIC Course in Heating, Ventilation and Air Conditioning Services, which was accredited in July 2012. The training contributes to improved energy efficiencies and the reduction of carbon emissions. The course is now due for re-accreditation. A mid-term review and industry survey have confirmed the ongoing need for the course, which has been designed as a post-trade qualification. Although the UEE11 Electrotechnology Training Package contains trade and post trade qualifications for the industry, there are no units of competency that address the skills and knowledge identified by the industry reference group. The enrolments in the course have been approximately twenty annually and the AMCA recognise the course as their Master Refrigeration Program. A skills and knowledge survey was developed and responses were sought from heating, ventilation and air conditioning practitioners. The survey results identified a range of skills and knowledge as critical or very important. These include: • working with others • OH&S principles and practices • legislation/regulations/by-laws • Australian standards and building codes • control hardware and software

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	• system inspection, testing and tuning • energy management strategies • essential safety measure requirements • record keeping A course steering committee was established to advise on the development of this consisting of: Peter Keating (Chair) — TDM Solutions Laura Steedman — Air Conditioning and Mechanical Contractors Association (AMCA) Noel Munkman — Australian Refrigeration Council John Plowman — AG Coombs Servicing Rory McGinley — Box Hill TAFE <u>In attendance</u>: George Adda — Engineering Industries Curriculum Maintenance Manager, Box Hill Institute of TAFE. Sam McCurdy — Dewhurst Consultancy Pty Ltd Tony Watson — RTO-representative (Box Hill TAFE)
3.2 Review for re-accreditation	A mid cycle review of the course was conducted in August 2015. A survey was then conducted of Registered Training Organisations (RTOs) and the industry using Survey Monkey. The survey sought feedback on the ongoing need for the course, its structure and the content of the units of competency. Meetings were also held with Industry stakeholders on the 10th December 2015 and 5th May 2016 in relation to the survey and the addition of elective units. The consultation confirmed the need for the course and supported the industry request for the addition of units of competency on the following topics: • Safety awareness of hydrocarbons and carbon dioxide refrigerant • Servicing of hydrocarbon air conditioning systems and carbon dioxide refrigeration systems • Sustainable work practices This course supersedes 22201 VIC Course in Heating, Ventilation and Air Conditioning and is deemed to be equivalent. The transition arrangements for the course are provided below.

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Transition Arrangements for 22329VIC

22201VIC **Course in Heating, Ventilation and Air Conditioning Services**		**22329VIC** **Course in heating, Ventilation and Air Conditioning Services**		**Comments**
Unit Code	**Unit Title**	**Unit Code**	**Unit Title**	
Core Unit:				
VU20872	Advise clients on heating, ventilation and air conditioning services	VU21958	Advise clients on heating, ventilation and air conditioning services	Equivalent
Elective Units:				
VU20873	Maintain control devices	VU21959	Maintain control devices and systems	Equivalent
VU20874	Maintain essential safety measures	VU21960	Maintain essential safety measures	Equivalent
		VU22583	Handle Class A2/A2L Flammable Refrigerants	New Unit
		UEENEEJ174A	Apply safety awareness and legal requirements for hydrocarbon refrigerants	New unit
		UEENEEJ175A	Service and repair self contained hydrocarbon air conditioning and refrigeration systems	New unit
		UEENEEJ184A	Repair and service carbon dioxide refrigeration systems	New unit
		UEENEEJ185A	Repair and service carbon dioxide refrigeration systems	New unit
		MSMENV272	Participate in environmentally sustainable work practices	New unit

4. Course outcomes	***Standards 1, 2, 3, 4 and 5 AQTF Standards for Accredited Courses***
4.1 Qualification level	*Standards 1, 2 and 3 AQTF Standards for Accredited Courses* The Course in Heating, Ventilation and Air Conditioning Services meets an identified industry/enterprise or community need, but does not have the breadth, depth or volume of learning of a qualification
4.2 Employability skills	*Standard 4 AQTF Standards for Accredited Courses* Not applicable
4.3 Recognition given to the course	*Standard 5 AQTF Standards for Accredited Courses* The course in recognised by the AMCA as a Master Refrigeration Program

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4.4 Licensing/ regulatory requirements	*Standard 5 AQTF Standards for Accredited Courses* Not applicable

5. Course rules **Standards 2, 6,7 and 9 AQTF Standards for Accredited Courses**

5.1 Course structure

To gain a Statement of Attainment for the Course in Heating, Ventilation and Air Conditioning Services, participants must complete the core unit and one (1) elective unit of competency listed in the table below.

Participants who do not complete the full course will be awarded a Statement of Attainment listing the unit they have successfully completed.

Unit of competency code	Field of Education code	Unit of competency title	Pre-requisite	Nominal hours
Core Unit				
VU21958	031315	Advise clients on heating, ventilation and air conditioning services	N/A	4
Elective Units (Select one unit)				
VU21959	031315	Maintain control devices and systems	N/A	40
VU21960	031315	Maintain essential safety measures	N/A	40
VU22583	031315	Handle Class A2/A2L Flammable Refrigerants	N/A	30
UEENEEJ174A	031315	Apply safety awareness and legal requirements for hydrocarbon refrigerants	N/A	10
UEENEEJ175A	031315	Service and repair self contained hydrocarbon air conditioning and refrigeration systems	*Pre-requisites	20
UEENEEJ184A	031315	Apply safety awareness and legal requirements for carbon dioxide refrigerant	N/A	10
UEENEEJ185A	031315	Repair and service carbon dioxide refrigeration systems	*Pre-requisites	20
MSMENV272	050999	Participate in environmentally sustainable work practices	N/A	30
Total nominal hours				**14 - 44**

*This unit has a number of pre-requisites. Learners who hold either a UEE32211 Certificate III in Air Conditioning and Refrigeration, UEE32111 Certificate III in Appliance Service or MEM30205 Certificate III in Engineering – Mechanical Trade or equivalent trade qualification are most likely to meet the pre-requisites requirements of this unit.

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5.2 Entry requirements	*Standard 9 AQTF Standards for Accredited Courses* It is expected that learners have a trade qualification such as: • UEE32211 Certificate III in Air Conditioning and Refrigeration • UEE32111 Certificate III in Appliance Service • MEM30205 Certificate III in Engineering – Mechanical Trade or equivalent qualification or have equivalent level of work experience in the heating, ventilation and air conditioning industry. Students may enter below this level at the discretion of the RTO. It is also recommended that learners also have language, literacy and numeracy skills that are equivalent to Level 3 of the Australian Core Skills Framework (ACSF) Full details, descriptors and tests of the ACSF can be found on the website link here. Learners who have lower levels of language and literacy may require additional support to complete the course.
6. Assessment	***Standards 10 and 12 AQTF Standards for Accredited Courses***
6.1 Assessment strategy	*Standard 10 AQTF Standards for Accredited Courses* All assessments, including Recognition of Prior Learning (RPL) must be consistent with: • Standard 1, Element 1.5 of the Australian Quality Training Framework (AQTF): *Essential Conditions and Standards for Continuing Registration or;* • Standard 1, Clauses1.1 and 1.8 of the *Standards for Registered Training Organisations (RTOs) 2015, or;* • The relevant Standards for Registered Training Organisations in effect at the time of assessment. Assessment strategies must therefore ensure that: • all assessments are valid, reliable, flexible and fair • learners are informed of the context and purpose of the assessment and the assessment process • feedback is provided to learners about the outcomes of the assessment process and guidance given for future options • time allowance to complete a task is reasonable and specified to reflect the industry context in which the task takes place.

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	Assessment strategies should be designed to: • cover a range of skills and knowledge required to demonstrate achievement of the course aim • collect evidence on a number of occasions to suit a variety of contexts and situations • be appropriate to the knowledge, skills, methods of delivery and needs and characteristics of learners • assist assessors to interpret evidence consistently • recognise prior learning • be equitable to all groups of learners. Assessment methods are included in each unit and include : • direct observation of processes and procedures • oral and/or written questioning • inspection of final process outcomes • portfolio of documentary work based evidence • case studies • work projects A holistic approach to assessment may be used, by combining the assessment of more than one unit, where it better replicates working practice and reduces the potential for over assessment. Assessment of the imported unit must reflect the requirements of the Assessment Guidelines for the relevant Training Package.
6.2 Assessor competencies	*Standard 12 AQTF Standards for Accredited Courses* Assessment must be undertaken by a person or persons with competencies compliant with: • Standard 1.4 of the *AQTF: Essential Conditions and Standards for Continuing Registration*, and/or • Standard 1, Clauses 1.13, 1.14, 1.15, 1.16 and 1.17 of the *Standards for Registered Training Organisations 2015* (SRTOs), and/or • The relevant Standards for Registered Training Organisations in effect at the time of assessment. Assessors of the endorsed unit of competence must meet the requirements for assessors specified in the relevant Training Package. In addition to the above, it is recommended assessors have current knowledge of the application of relevant codes of practice and standards in the inspection and testing of HVAC systems that include smoke and fire control features of air handling systems, optimising indoor air quality and enhancing energy efficiency.

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	Alternatively, a panel, team or partnership approach involving assessors and technical experts whereby the assessment is conducted by a team/panel/partnership in which at least one assessor has the competencies required under the *Standards for Registered Training Organisations (RTOs) 2015* and the other assessor(s) have the relevant vocational competencies, at least to the level being assessed.
7. Delivery	***Standards 11 and 12 AQTF Standards for Accredited Courses***
7.1 Delivery modes	*Standard 12 AQTF Standards for Accredited Courses* This course is available for full or part-time study. Providers should endeavor to be flexible in the way the training is delivered to ensure they meet the needs of the client group. Delivery strategies should be selected to reflect the nature of the Heating, Ventilation and Air Conditioning (HVAC) Services industry specific competencies, incorporating employability skills, and the needs of the learner. The course aims to develop practical competencies within the HVAC Services industry setting. Practical demonstrations and opportunity for application are considered to provide the most suitable strategy to reflect the objectives of the course and the background to its development. Delivery methods may include, but are not limited to: • classroom presentation • work-based projects • self-paced learning • case study analyses • practical exercises • projects Providers may contextualise units to suit particular learners by using material relevant to the students' experience or traditions and by extending the required knowledge of units. Generally, this means: • Elements and associated performance criteria must not be altered in any way; • The Range Statement may be expanded as long as it does not increase the complexity of the unit • The Evidence Guide may be expanded as long as it retains the integrity of the unit and does not jeopardise the student's potential to achieve the competency. • Learning and assessment resources may be tailored to the specific needs of the target group, while maintaining their validity • Contextualisation of the endorsed imported unit of competency must be consistent with the guidelines of the relevant Training Package

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	An emphasis on safety must be integrated and reinforced at all times.
7.2 Resources	*Standard 12 AQTF Standards for Accredited Courses* General facilities, equipment and other resources required to deliver the proposed Course in Heating, Ventilation and Air Conditioning Services include: • training facilities and equipment • relevant texts and references • occupational health and safety facilities and equipment • occupational health and safety policy and work procedures/instructions • access to relevant legislation, service installation information, standards and codes of practice • access to relevant equipment, tools, machines, materials and consumables • access to plans, drawings and instructions • manufacturers' specifications/manuals • a workplace environment or simulated workplace environment appropriate to the assessment tasks
	Training must be undertaken by a person or persons with competencies compliant with: • Standard 1.4 of the *AQTF: Essential Conditions and Standards for Continuing Registration*, and/or • Standard 1, Clauses 1.13, 1.14, 1.15, 1.16 and 1.17 of the *Standards for Registered Training Organisations 2015* (SRTOs), and/or • The relevant Standards for Registered Training Organisations in effect at the time of assessment.
8. Pathways and articulation	*Standard 12 AQTF Standards for Accredited Courses* There is no formal articulation or credit transfer arrangements into other VET or higher education qualifications from the Course in Heating, Ventilation and Air Conditioning Services. When arranging articulation providers should refer to the: *AQF Second Edition 2013 Pathways Policy* Participants must negotiate individual pathway arrangements directly. Graduates of the course who have completed any of the imported units of competency will gain credits in any future studies that include these units. Likewise participants who have already completed any of the imported units of competency in previous training, will be granted credits for the relevant units.

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9. Ongoing monitoring and evaluation	*Standard 13 AQTF Standards for Accredited Courses* Ongoing evaluation and validation of this course is the responsibility of the Curriculum Maintenance Manager, Engineering Industries. A course advisory committee will be established for the ongoing monitoring and evaluation of the course. It will include: • Curriculum Maintenance Manager, Engineering Industries • Course providers • Industry representatives The committee will: • review the implementation of the course • provide advice on changing program requirements, such as the need to add elective units to meet defined industry needs • monitor and evaluate course standards, delivery and assessment • assess the continuing need for the course should an appropriate qualification or units of competency be incorporated into the national endorsed Training Package. The course advisory committee will meet at least once during the accreditation period for a mid-term review. Additional meetings may be scheduled on a needs basis. Recommendations for any significant changes will be reported through the Curriculum Maintenance Manager, Engineering Industries to the VRQA.

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Section C: Units of competency

Imported units of competency:

UEENEEJ174A	Apply safety awareness and legal requirements for hydrocarbon refrigerants
UEENEEJ175A	Service and repair self contained hydrocarbon air conditioning and refrigeration systems
UEENEEJ184A	Apply safety awareness and legal requirements for carbon dioxide refrigerant
UEENEEJ185A	Repair and service carbon dioxide refrigeration systems
MSMENV272	Participate in environmentally sustainable work practices

Victorian units of competency

VU21958	Advise clients on heating, ventilation and air conditioning services
VU21959	Maintain control devices and systems
VU21958	Maintain essential safety measures
VU22583	Handle Class A2/A2L Flammable Refrigerants

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VU21958 Advise clients on heating, ventilation and air conditioning services

Unit Descriptor

This unit provides the skills and knowledge required to provide information and advice to clients on heating, ventilation and air conditioning services. It focuses on environmental responsibilities and includes an overview of relevant legislation. No licensing or certification requirements apply to this unit at the time of accreditation.

Employability skills

This unit contains employability skills.

Application of the Unit

This unit is applicable to trade and post-trade technicians working in the HVAC sector and who are required to provide advice to clients as part of their role. This is likely to be undertaken without supervision.

ELEMENT	PERFORMANCE CRITERIA
1. Determine service responsibilities	1.1 Legal requirements and environmental responsibilities of service providers and clients are established.
	1.2 Scope of environmental responsibilities of technicians are clarified and discussed with ***clients***.
	1.3 General information on ***environmental issues*** and risk minimisation is provided to clients.
	1.4 Advice on the benefits of environmental protection and energy management is provided to clients including any current incentive schemes.
	1.5 Occupational health and safety risks and control measures are identified in relation to advice.
2. Provide environmentally sustainable options to clients	2.1 HVAC system requirements are analysed and sustainable options, compliant with ***relevant standards*** are identified.
	2.2 Different options appropriate to the HVAC application are compared for efficiency and effectiveness.
	2.3 Appropriate options and implementation strategies are identified in discussion with clients.
	2.4 Contingencies are discussed and agreed to with clients where required.
3. Document advice for clients	3.1 Summary of recommended options are recorded.
	3.2 Check and confirm client's understanding of the advice provided
	3.3 A clear and well-structured report is prepared and forwarded to the client.

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Required Skills and Knowledge

This describes the essential skills and knowledge and their level required for this unit

Required Skills:

- distinguishing between, residential, commercial and industrial energy consumption sectors
- identifying potential energy savings
- making recommendations based on analysis and evidence
- communicating effectively verbally and in writing
- working effectively with others
- interpreting and applying relevant standards and codes

Required Knowledge:

- greenhouse effect and its impact on climate change
- overview of government legislation and policy
- principles of energy efficiency
- energy ratings for buildings
- energy efficiency technologies
- requirements of the relevant codes, standards, statutory authorities requirements
- safe work methods and principles

Range Statement

The Range Statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold / italicised wording in the Performance Criteria is detailed below.

Clients may include, but are not limited to:	• supervisor • building manager/owner • site engineer • technicians and apprentices • specialist service providers • facilitator/coordinator
Environmental issues may include, but are not limited to:	• global warming • carbon emissions • waste management • sustainable use of resources • noise reduction • energy efficiency
Relevant standards may include, but are not limited to:	• Building Code of Australia • Australian Standards (AS1851, 1668, 3666) • legislation, regulations and by-laws • enterprise requirements • National Australian Built Environment Rating System (NABERS) • Green star environmental rating system

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment section in Section B of the accreditation submission.

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Critical aspects for assessment and evidence required to assess competency in this unit	To be considered competent in this unit candidates must demonstrate the achievement of all of the elements of competency to the level defined by the associated performance criteria and utilising the required skills and knowledge. Specifically they must be able to: • implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures; • demonstrate required knowledge and skills to provide verbal and/or written advice to clients on environmental sustainability and energy management taking into account current legislative responsibilities and codes of practice; • demonstrate competency within a timeframe expected of the discipline, work function and industrial environment
Context of and specific resources for assessment	Evidence should show competency working in a realistic environment and a variety of conditions. The candidate will have access to all tools, equipment, materials and documentation required. The candidate will be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials. This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.
Method of assessment	Evidence can be gathered through a variety of ways including: – observation of processes and procedures; – oral and/or written questioning on required knowledge and skills; – testimony from supervisors, colleagues, clients and/or other appropriate persons; – inspection of the final product or outcome; – a portfolio of documentary evidence. Where performance is not directly observed and/or is required to be demonstrated over a period of time and/or in a number of locations, any evidence should be authenticated by colleagues, supervisors, clients or other appropriate persons. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency.

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VU21959 Maintain control devices and systems

Unit Descriptor

This unit of competency sets out the knowledge and skills required to operate and maintain heating, ventilation and air conditioning (HVAC) control devices and systems within a framework of achieving energy efficiencies and meeting sustainable energy targets.

This includes operating and maintaining hardware and software, and tuning system performance and, interpreting and updating control diagrams as well as skills in interpreting control system specifications and OHS requirements.

No licensing or certification requirements apply to this unit at the time of accreditation.

Employability Skills

This unit contains employability skills.

Application of the Unit

This unit would be applied by HVAC technicians responsible for installing, commissioning and optimising the performance of control systems in commercial buildings to ensure that they meet the building specifications, relevant regulatory requirements and industry codes of practice. This is likely to be undertaken without supervision.

ELEMENT	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element – they identify the standard for the element. Where bold/italicised text is used, further information or explanation is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide
1. Prepare to test, tune and maintain control systems	1.1 ***OHS requirements*** and ***environmental requirements*** for a given work area are clarified with ***appropriate personnel.***
	1.2 Performance guidelines are identified.
	1.3 Drawings, specifications, schedules and system software are obtained.
	1.4 Tools, equipment and measurement instruments for maintenance, testing and calibration are obtained.
	1.5 Energy saving and renewable energy control options are identified.
2. Operate HVAC control hardware and software systems	2.1 Schematic drawings and system performance maintenance manuals are read and interpreted.
	2.2 Schematic drawings, system performance maintenance manuals, and servicing and periodic tuning schedules are used to identify control sensors and devices to be tested and maintained.
	2.3 Appropriate test and measurement instruments are used.
	2.4 HVAC ***control devices*** are operated***.***

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	2.5	Control ***software*** is operated in compliance with building operating requirements***.***
	2.6	Monitoring and control using remote access and local human machine Interface are performed.
	2.7	Energy consumption is optimised.
	2.8	OHS requirements and environmental requirements are implemented to industry standards.
3. Optimise HVAC control and software systems	3.1	Appropriate test and measurement instruments are used.
	3.2	Hardware and software testing is performed to meet system performance specifications
	3.3	***Test equipment*** is checked for correct operation
	3.4	Control devices are tested for correct operation/calibration and adjusted, repair or replaced where necessary
	3.5	System hunting, short cycling or system fighting is rectified
	3.6	System performance is tuned to meet energy management strategies.
4. Maintain HVAC system and manage energy consumption	4.1	Maintenance is performed according to schedules, periodic tuning schedules and observation of trend logs
	4.2	HVAC systems are adjusted to optimize performance consistent with principles of energy efficiency
	4.3	Unscheduled events are responded to and contingencies are implemented
5. Finalise HVAC operating and maintenance activities	5.1	Drawings, schematics and description of operation are updated.
	5.2	Details of changes made to tuning set points, parameters, high/low limits and manual/auto settings are documented as required
	5.3	Work area is cleaned and left safe according to ***building procedures***.

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level required for this unit.

Required Skills:

- follow OH&S requirements
- read and interpret schematic drawings and description of operation
- use tools and equipment
- upgrade and/or replace hardware
- install and use building automation and control software
- tune HVAC systems to achieve optimal operation
- update trend logs
- maintain control system

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- employ energy management strategies

Required Knowledge:

- types of controls including stand alone, pneumatic, Direct Digital Control (DDC), building management systems, local controls
- purpose of HVAC control systems
- safety precautions specific to HVAC systems and devices
- features and operation HVAC control hardware and software
- major HVAC plant and equipment, field controllers and devices
- third party equipment and interfaces such as fire systems, water treatment equipment; people counters; security; lighting
- different types of data communication systems used in control systems

RANGE STATEMENT

The Range Statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold / italicised wording in the Performance Criteria is detailed below.

OHS requirements may include but are not limited to:	• legislation • Job Safety Analysis (JSA) • Safe Work Method Statements (SWMS) • Personal protective equipment (PPE) • building safety management systems and house rules • hazardous substances and dangerous goods code.
Environmental requirements may include but are not limited to:	• excessive energy and water use • excessive noise • liquid waste • solid waste • gas, fume, vapour, smoke emissions.
Appropriate personnel may include but are not limited to:	• supervisor • building manager/owner • site engineer • technicians and apprentices • specialist service providers • facilitator/coordinator.
Control devices may include but are not limited to:	• sensors • Variable Speed Drives (VSDs) • Variable Air Volumes (VAVs) • stroking dampers and actuators • duct heaters and re-heats.

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Software may include but are not limited to:	• graphics • trend Logs • licensing • data back up • time scheduling • set points and alarms • software upgrades • making system changes • managing changes • security and passwords
Test equipment may include but are not limited to:	• thermometer • humidity meter • multi-meter / tong tester • CBI (flow meter) • Co and Co_2 sensors
Building procedures may include but are not limited to:	• inductions and house rules • evacuation procedures • security and access • the use of tools and equipment • instructions, including log sheets, plans, drawings and designs • reporting and communication • manufacturers' specifications and operational procedures

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Elements, Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment section in Section B of the Accreditation Submission.

Critical aspects for assessment and evidence required to demonstrate competency	To be considered competent in this unit candidates must demonstrate the achievement of all of the elements of competency to the level defined by the associated performance criteria and utilising the required skills and knowledge. Specifically they must be able to: • Apply knowledge and principles of HVAC control systems by: – Implement relevant OHS procedures and practices; – Organise relevant resources, personnel and equipment to effectively install and configure HVAC control software; – Interpret and use control system drawings and specifications; – Analyse and optimise HVAC control system performance to meet the building specifications and

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energy management strategies in accordance with enterprise goals;
- Identify and repair or replace faulty system components;

Context of and specific resources for assessment

- This unit must be assessed in the context of industrial HVAC control systems. Where personal safety or environmental damage are limiting factors, assessment may occur in a simulated environment provided it is realistic and sufficiently rigorous to cover all aspects of workplace performance.
- Assessment of this competency requires typical resources normally used in a commercial HVAC control system environment.
- The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team.
- Assessors should also be familiar with commercial HVAC control system environments.

Methods of assessment

Evidence can be gathered through a variety of methods. These may include:

- demonstration of practical skills in a real or simulated environment
- case studies
- work projects
- written/oral tests to assess the underpinning knowledge
- 3rd party reports
- portfolio of documentary evidence

Where performance is not directly observed and/or is required to be demonstrated over a period of time and/or in a number of locations, any evidence should be authenticated by colleagues, supervisors, clients or other appropriate persons.

Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency.

The candidate must have access to all relevant resources.

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VU21960 Maintain essential safety measures

Unit Descriptor

This unit describes the outcomes required to maintain heating, ventilation and air conditioning related essential safety measures (ESMs) such as fire and smoke control measures of air handling systems.

This unit focuses on responsibilities and statutory requirements of building owners, contractors and maintenance technicians.

Although this unit does not include designing systems, it includes understanding the different types of systems and their installation and *AS1851 Maintenance of fire protection systems and equipment, AS1668 The use of ventilation and air-conditioning in buildings, AS3666 Microbial control of air handling systems* and the Building Code of Australia and Building Regulations.

No licensing or certification requirements apply to this unit at the time of accreditation.

Employability skills

This unit contains employability skills.

Application of the Unit

This unit is suitable for post initial trade training in the electrical or refrigeration and air conditioning sectors.

The skills and knowledge of this unit are to be appropriately applied to buildings constructed pre and post 1994 and post 2004. This is likely to be undertaken without supervision.

ELEMENT	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold/italicised test is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*
1. Plan safety checks and maintenance activities.	1.1 ***OHS requirements*** relevant to the task and workplace are determined.
	1.2 Relevant ***manuals, standards, permits, compliance forms and regulations*** are obtained***.***
	1.3 ***Essential safety measures (ESMs)*** required to maintain correct operation and statutory requirements are identified.
	1.4 ***Relevant ESMs*** according to building vintage, type and/or refurbishment are determined.
	1.5 Maintenance/inspection cycle or schedule in compliance with legal requirements and responsibilities are determined.
	1.6 Log-sheet of safety and/or operational checks, inspections, tests and maintenance action requirements are obtained or created.
	1.7 Required tools, instruments, equipment and ***resources*** are determined***.***

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2. Perform essential safety measures inspections and tests	2.1	Inspection and test tools, instruments or ***equipment*** are obtained.
	2.1	Tools, instruments and equipment for correct operation and calibration if required are checked.
	2.3	ESM inspections and tests on individual components or sections are performed.
	2.4	System inspections and tests in compliance with legal requirements and responsibilities and OHS requirements are carried out***.***
3. Carry out essential safety measures maintenance	3.1	Maintenance work in compliance with legal requirements and responsibilities and OHS requirements are carried out.
	3.2	Equipment/machines and plant are isolated and checked where necessary in strict accordance with OHS requirements.
	3.3	***Maintenance tasks*** are carried out according to log-sheets without compromising the integrity of the building or environmental requirements.
	3.4	Maintenance personnel required to perform the tasks are coordinated in an efficient manner.
	3.5	Responsibility boundaries with other maintenance participants are observed.
	3.6	Unexpected situations are addressed by reference to job specifications, ***building management procedures*** and discussion with ***appropriate personnel.***
	3.7	Faults are identified and reported and rectification solutions recommended.
	3.8	Plant and equipment are checked for correct operation upon completion of maintenance task.
4. Maintain records	4.1	Notes and/or complete checklists of the inspections, tests and maintenance carried out are prepared.
	4.2	Notes, checklists and updated log sheets are collated.
	4.3	Safety checks and maintenance are signed off and reports submitted to building manager/owner.
	4.4	Annual ESM ***compliance forms*** are completed and submitted***.***

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required Skills:

- test air handling changeover under fire/smoke conditions
- test fire isolated escape routes protected by air-pressurisation systems
- use test instruments
- carry out performance testing

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- report faults and recommend solutions
- sign off and submit documentation

Required Knowledge:

- types of essential safety measures (ESM)
- types of buildings and ESM requirements based on occupancy permit
- Building Code of Australia, regulations and legislation
- legal requirements and responsibilities
- maintenance participants and responsibilities
- maintenance, inspection and testing standards
- documentation types and their purpose

RANGE STATEMENT

The Range Statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold / italicised wording in the Performance Criteria is detailed below.

OHS requirements may include, but are not limited to:	• legislation • Job Safety Analysis (JSA) • Safe Work Method Statements (SWMS) • protective equipment and PPE • building safety management systems and house rules • hazardous substances and dangerous goods code
Manuals, standards, permits, compliance forms and regulations may include, but are not limited to:	• Building Code of Australia (BCA) • Victorian Building Regulations 2006 • Essential Safety Measures Maintenance Manual • AS1851 • AS1668 • AS3666 • Asset register • operating and maintenance manual • occupancy permit • determinations • engineered solutions
Essential safety measures (ESMs).	• fire, life safety and health items installed or constructed in a building to ensure adequate levels of fire safety and protection

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Relevant ESM	• a subset of ESMs from the *Essential Safety Measures Maintenance Manual* selected according to building occupancy permit
Resources may include but are not limited to:	• personnel • plant data sheets • log sheets • asset register • operational and performance records • maintenance schedules • manufacturers' instructions, specifications and services manuals • appropriate consumables and spare parts • building management systems
Equipment may include but are not limited to:	• appropriate hand and power tools • test equipment • measuring and aligning equipment • computer equipment • personal protective equipment • cleaning equipment
Maintenance task	• maintenance inspections and testing in a regulated and occupied building environment.
Building management procedures may include but are not limited to:	• inductions and house rules • evacuation procedures • security and access • use of tools and equipment • instructions, including log sheets, plans, drawings and designs • reporting and communication • manufacturers' specifications and operational procedures
Appropriate personnel may include but are not limited to:	• supervisor • building manager/owner • site engineer • technicians and apprentices • specialist service providers • facilitator/coordinator
Compliance forms may include but are not limited	• ESM compliance forms

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to:

- annual ESM reports

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Elements, Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment section in Section B of the Accreditation Submission.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

To be considered competent in this unit candidates must demonstrate the achievement of all of the elements of competency to the level defined by the associated performance criteria and utilising the required skills and knowledge.

Specifically they must be able to:

- implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range;
- demonstrate knowledge of the legal requirements and responsibilities in relation to ESMs
- demonstrate the performance criteria within a timeframe expected of the discipline, work function and industrial environment; and
- demonstrate the ability to plan, implement and apply a building maintenance program on more than one occasion and in different contexts.

Context of and specific resources for assessment

- This unit may be assessed on the job, off the job or a combination of both.
- Where assessment occurs off the job, that is the candidate is not in productive work, then a simulation must be used where the range of conditions are consistent with realistic workplace situations.
- The competencies covered by this unit may be demonstrated by an individual working alone or as part of a team.
- The assessment environment should not disadvantage the candidate.

Method(s) of assessment

- Evidence can be gathered through a variety of ways including:
  - practical skills demonstrated in a real or simulated environment
  - observation of processes and procedures
  - oral and/or written questioning on required knowledge and skills
  - testimony from supervisors, colleagues, clients and/or other appropriate persons

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- inspection of the final product or outcome;
- a portfolio of documentary evidence.

- Where performance is not directly observed and/or is required to be demonstrated over a period of time and/or in a number of locations, any evidence should be authenticated by colleagues, supervisors, clients or other appropriate persons.
- Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency.
- The candidate must have access to all relevant resources.

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VU22583 Handle Class A2/A2L Flammable Refrigerants

Unit Descriptor

This unit of competency describes the, skills and knowledge required to safely handle, use, store and transport A2/A2L classified flammable refrigerants.

The unit includes working safely; complying with relevant legislative, regulatory/licensing, standards and codes requirements; relevant performance characteristics; manufacturers' recommendations/ instructions and industry practices; and completing the necessary documentation.

The Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995 apply to this unit at the time of accreditation. This requires that persons carrying out this work must hold a national Refrigerant Handling Licence issued by the Australian Refrigeration Council as it carries the risk of a fluorocarbon refrigerant being emitted.

Employability Skills

This unit contains employability skills.

Entry Requirements

A person undertaking this unit shall hold the:

- Australian Refrigeration Council (ARC) refrigerant handling licence:
  - RAC01 Full refrigeration and air conditioning licence, or
  - RSS03 Restricted heat pump, split systems – installation and decommissioning licence, or
  - RDR04 Restricted domestic refrigeration and air conditioning appliances licence

And if required a:

- State/Territory occupational licence to carry out the refrigeration and/or air conditioning work, for example the:
  - Victorian Building Authority's Registration or Licence for Plumbing, Mechanical Services - Refrigerated Air Conditioning work.

Application of the Unit

This unit would be applied by refrigeration and air conditioning technicians responsible for installing, commissioning, servicing, repairing and maintaining residential or commercial-refrigeration and air conditioning systems containing A2/A2L classified flammable refrigerants. These activities are likely to be undertaken without supervision.

Competency Field

Electrotechnology

Sector

Refrigeration and Air Conditioning

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ELEMENT	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the required performance needed to demonstrate achievement of the element – they identify the standard for the element. Where bold/italicised text is used, further information or explanation is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide*
1. Prepare to work with A2/A2L flammable refrigerants.	1.1 Clarify ***Workplace Health & Safety/Occupational Health & Safety (WHS/OHS) requirements*** and ***environmental requirements*** for a given work area with ***appropriate personnel.***
	1.2 Identify hazards and control measures and procedures before commencing the work.
	1.3 Establish the scope and nature of work to be undertaken from documentation and/or from work, site or building supervisor and/or end user.
	1.4 Select and obtain the materials, ***tools and equipment***, ***measuring and testing devices,*** and personal protective equipment needed to carry out the work and check them for correct operation.
	1.5 Transport refrigerant in accordance with requirements (PC added)
	1.6 Check tools and fittings are appropriate for the refrigerant type and designed to prevent/minimize refrigerant loss.
2. Recover, pressure/leak test, evacuate and charge systems using A2/A2L classified refrigerant.	2.1 Carry out the work in accordance with established WHS/OHS and environmental risk control measures and procedures, relevant regulations, ***standards***, ***codes of practices***, ***safety guides*** and ***safety systems.***
	2.2 Confirm that the system is electrically isolated and appropriately tagged/locked off.
	2.3 Pump down the system or recover the refrigerant safely into labelled recovery cylinder/s that complies with the relevant standard.
	2.4 Pressure test the system using dry nitrogen at the required pressure for the refrigerant to be used without causing damage.
	2.5 Evacuate the system in accordance with the relevant standard and the Refrigerant Handling Code of practice to ensure removal of moisture and other contaminants and using an appropriate vacuum pump and gauge.
	2.6 Repair refrigerant leaks before charging with refrigerant.
	2.7 Charge the system with the A2/A2L refrigerant in accordance with manufacturer's specifications/instructions and industry practices.
	2.8 Measure and record the system’s operating conditions and ensure system is operating within manufacturer’s specifications.

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	2.9	Leak test the system in accordance with the current Refrigerant Handling Code of practice and industry practices.
3. Complete work and relevant documentation	3.1	Complete the work following WHS/OHS risk control measures and procedures.
	3.2	Clean and make safe the work site in accordance with established procedures
	3.3	Dispose of contaminated refrigerant in accordance with ***legislation***/***regulatory requirements***
	3.4	Store refrigerant in accordance with regulatory requirements
	3.5	Clean, check and securely store tools and equipment
	3.6	Report any safety related issues to appropriate person/s.
	3.7	Complete required ***documentation*** in accordance with established enterprise procedures

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level required for this unit.

Required Skills:

- complying with relevant WHS/OHS requirements, policies, procedures and instructions including correct use of PPE and risk control measures while working with A2/A2L flammable refrigerant.
- applying environment protection and sustainable energy and resources principles and practices while working with A2/A2L flammable refrigerant.
- complying with relevant legislation, regulatory/licensing, standards and code requirements; manufacturers' recommendations/ instructions and industry practices while working with A2/A2L flammable refrigerant.
- selecting, obtaining and checking tools and equipment, and materials required to carry out the work appropriate for the A2/A2L flammable refrigerant and unit type.
- testing the system to ensure is electrically isolated and recover the refrigerant charge using an appropriate recovery unit and cylinder.
- pressure testing with dry nitrogen and leak test installed systems and repair any leaks.
- evacuate installed systems in preparation for charging with A2/A2L refrigerant using an appropriate vacuum pump and vacuum gauge
- charging installed systems with A2/A2L refrigerant
- checking system is operating within manufacturers specifications
- storing and transporting A2/A2L refrigerants safely
- disposing and processing recovered A2/A2L refrigerants
- cleaning, checking and securely storing tools and equipment and making the work site safe
- completing the task and relevant documentation
- reporting to appropriate person/s

Required Knowledge:

- types, composition, applications, flammability and toxicity of typical A2/A2L refrigerants including R32 and R1234yf
- operating pressures and temperatures of typical applications using A2/A2L refrigerants
- safe handling and transport requirements of A2/A2L refrigerants including Safety Data Sheets (SDS)

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- compatibility issues of A2/A2L refrigerants with class A1 refrigerant lubricants, materials, components and tools
- requirements for working with A2/A2L refrigerants including leak detection, recovery charge, pipe sizing, making joints and special tools.
- current relevant standards and codes for use of A2/A2L flammable refrigerants including AS/NZS ISO 817, AS/NZS 5149-4, AS/ANS 60335.2.40, Refrigerant handling code of practice, Ozone Protection and Synthetic Greenhouse Gas Management Act and Regulation and AIRAH Flammable Refrigerants Safety Guide.
- A2/A2L equipment manufacturer specifications for refrigeration and air conditioning systems, service gauges, vacuum pumps and gauges, recovery units, dry nitrogen cylinders and gauges and flammable refrigerant cylinders.
- emergency procedures and incident management requirements and procedures including relevant SDS and recommended PPE
- first aid issues and symptoms that result from short and long-term effects of contact, swallowing, splashing or inhalation
- A2/A2L refrigerant cylinders requirements including pressure ratings, pressure relief devices, outlet connection type and recovery cylinders
- A2/A2L refrigerant cylinder storage, handling and transport requirements
- Relevant State/Territory and national licensing requirements

RANGE STATEMENT

The Range Statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold / italicised wording in the Performance Criteria is detailed below.

WHS/OHS requirements may include but are not limited to:	• Legislation • Standards • Job Safety Analysis (JSA) • Safe Work Method Statements (SWMS) • Personal protective equipment (PPE) • Safety Data Sheets (SDS) • Refrigerant handling code of practice • building safety management systems and house rules • hazardous substances and dangerous goods code.
Environmental requirements may include but are not limited to:	• excessive energy and water use • excessive noise • liquid waste • solid waste • gas, fume, vapour, smoke emissions.
Appropriate personnel may include but are not limited to:	• supervisor • building manager/owner • site engineer • technicians and apprentices • specialist service providers • facilitator/coordinator.

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Tools and Equipment include but are not limited to:	• Refrigeration and air conditioning systems employing A2/A2L classified refrigerant (e.g. single head high wall split air conditioning system) • Refrigeration hand tools • Recovery unit suitable for the refrigerant • Recovery cylinders suitable for the refrigerant • Soap/water “bubbles” leak detection fluid • A2/A2L classified refrigerants • Equipment and tools suitable for flammable refrigerants • Vacuum pump and electronic or analogue vacuum gauge accurate to 500 microns • Dry nitrogen cylinder and regulator • Electronic and other leak detecting devices
Measuring and Testing Devices include but are not limited to:	• Refrigerant pressure/temperature chart • Scales for weighing recovery cylinder • Digital thermometers • Manifold gauges suitable for the refrigerant type
Standards include but are not limited to:	• AS/NZS ISO 817: Refrigerants – Designation and safety classification • AS/NZS 5149.4: Refrigerating systems and heat pumps - Safety and environmental requirements - Part 4: Operation, maintenance, repair and recovery
Codes of Practice include but are not limited to:	• Australia and New Zealand Refrigerant handling code of practice, Part 1 Self-contained low charge systems • Australia and New Zealand Refrigerant handling code of practice, Part 2 Systems other than self-contained low • charge systems
Safety Guides include but are not limited to:	• Flammable Refrigerants Safety Guide, Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH)
Safety Systems include but are not limited to:	• Personal Protective Equipment (PPE) suitable for handling flammable refrigerants including safety glasses, gloves and safety shoes • Safety Data Sheets (SDS) for refrigerants • Safe work method statements
Legislation include but are not limited to:	• Ozone Protection and Synthetic Greenhouse Gas Legislation Amendment Act (or Bill) and Regulations
Regulatory requirements include but are not limited to:	• National Refrigerant Handling Licensing and Refrigerant Trading Authorisations. • State/Territory occupational licenses for refrigeration, air conditioning and electrical work
Documentation including Reporting Formats, include but are not limited to:	• Australian Refrigeration Council’s (ARC) reporting requirements • Equipment manufacturer’s specifications and instructions • AIRAH’s Refrigerant Guide • AIRAH’s Flammable Refrigerants Safety Guide and Fact sheets

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- Equipment manufacturer's drawings, specifications and instructions

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Elements, Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment section in Section B of the Accreditation Submission.

Critical aspects for assessment and evidence required to demonstrate competency

To be considered competent in this unit candidates must demonstrate the achievement of all of the elements of competency to the level defined by the associated performance criteria and utilising the required skills and knowledge.

Specifically, they must be able to:

- Apply the principles of handling class A2/A2L flammable refrigerants using relevant standards and codes of practice
- Recover, pressure test, evacuate and recharge a refrigeration system using A2/A2L flammable refrigerants on more than one occasion in accordance with WHS/OHS requirements and codes of practice.
- Check that the system is operating within manufacturers specifications
- Handle, transport, store and dispose of A2/A2L flammable refrigerants in accordance with WHS/OHS requirements and codes of practice.

Context of and specific resources for assessment

- This unit must be assessed in the context of residential or commercial refrigeration or air conditioning systems operating on A2/A2L refrigerants. Where operational access, personal safety or environmental damage are limiting factors, assessment may occur in a simulated environment provided it is realistic and sufficiently rigorous to cover all aspects of workplace performance.
- Assessment of this competency requires typical resources normally used in servicing stationary residential or commercial refrigeration or air conditioning systems operating on A2/A2L refrigerants
- The competencies covered by this unit shall be demonstrated by an individual working alone.
- Assessors should also be familiar with stationary residential or commercial refrigeration or air conditioning systems.

Methods of assessment

A range of assessment methods shall be used to assess the performance outcomes, practical skills and knowledge. The following examples are appropriate for this unit:

- direct observation of the candidate performing A2/A2L refrigerant recovery, evacuation, pressure testing, charging and leak testing refrigeration or air conditioning systems in a real workplace setting or realistic simulated environment
- a log of work relevant activities, verified by a person qualified to supervise the work and validated by an assessor.

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- written and oral questioning to test underpinning knowledge of handling A2/A2L refrigerants
- review of portfolios of evidence and third-party workplace reports of on-the-job performance by the candidate.

Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency.

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