



Australian Government

Department of Education, Employment and Workplace Relations

CPCPMS5001A Design air conditioning and ventilation systems

Release: 1

CPCPMS5001A Design air conditioning and ventilation systems

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit of competency specifies the outcomes required to evaluate and design air conditioning and ventilation systems for residential, commercial and industrial applications.
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Application of the Unit

Application of the unit	This unit of competency supports the needs of experienced plumbers with a responsibility for providing consultancy or supervision in the evaluation and design of air conditioning and ventilation systems.
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Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units	Nil
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Employability Skills Information

Employability skills This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Evaluate design parameters.	1.1. Client requirements are determined from plans, specifications and client briefs to determine work scope. 1.2. User comfort conditions and specific use conditions are evaluated and psychometric evaluation and heat loads are calculated. 1.3. Building heat losses are evaluated. 1.4. Distribution requirements for air conditioning and ventilation system applications are specified. 1.5. Range of air conditioning and ventilation systems are evaluated in accordance with given applications. 1.6. Mechanical services drawings are evaluated and interpreted. 1.7. Health risks that may arise due to poor maintenance of air conditioning and ventilation systems are evaluated. 1.8. Minimum performance requirements are specified for several different air conditioning and ventilation systems. 1.9. Manufacturer specifications and technical manuals are evaluated for suitability for a range of design applications.
2. Plan system components.	2.1. Appropriate zoning of air conditioning and ventilation systems is planned to comply with given specific performance objectives. 2.2. Air conditioning units are specified for optimum performance with reference to legislation, standards and other relevant documentation. 2.3. Fan types are specified for a range of applications with reference to legislation, standards and other relevant documentation. 2.4. Air diversion systems, including registers, are planned to ensure a balanced system with reference to legislation, standards and other relevant documentation. 2.5. Required ventilation and duct work components are planned and locations are specified with reference to legislation, standards and other relevant documentation. 2.6. Approved materials for air conditioning and ventilation systems are specified.

ELEMENT	PERFORMANCE CRITERIA
	2.7.Plans and drawings are completed using Australian standard drawing symbols related to air conditioning and ventilation in accordance with legislation, standards and other relevant documentation.
3. Design and size systems.	3.1.Volume air changes per hour are calculated from given floor plans and details. 3.2.Methods for eliminating health risks from existing or proposed systems are specified with reference to legislation, standards and other relevant documentation. 3.3.Range of air conditioning and ventilation systems for given applications is designed and sized.
4. Test systems.	4.1.Test procedures for air conditioning and ventilation systems are evaluated. 4.2.Tests are conducted using appropriate testing equipment, results are recorded and report is prepared. 4.3.Adjustments required as a result of testing are planned, designed and specified.
5. Prepare documentation.	5.1.Appropriate checklist, including formulas required to carry out an air balance to a given specification, is developed. 5.2.Plans are prepared for a range of air conditioning and ventilation systems. 5.3.Specification for an air conditioning and ventilation system is prepared. 5.4.Testing and commissioning schedule is prepared. 5.5.Operation and maintenance manual is produced.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills for this unit are:

- communication skills to:
 - communicate with others to ensure safe and effective work practices

REQUIRED SKILLS AND KNOWLEDGE

- confirm job specifications and client requirements
- enable clear and direct communication, using questioning to identify and confirm requirements, share information, listen and understand
- read and interpret:
 - plans, specifications, drawings and design briefs
 - manufacturer requirements and manuals
 - statutory and regulatory requirements and standards
- use language and concepts appropriate to cultural differences
- use and interpret non-verbal communication
- written skills to prepare documentation, including:
 - operation and maintenance manual
 - plans, specifications and schedules
- innovation skills to develop creative and responsive approaches
- numeracy skills to:
 - apply formulas and calculate air displacements and returns
 - calculate heat loads
- planning and organisational skills to:
 - research, collect, organise and understand information relating to the design of air conditioning and ventilation systems
 - take initiative and make decisions
- problem solving skills to analyse requirements, carry out tests, consider options and design an appropriate system
- teamwork skills to be able to work with others and action tasks and relate to people from a range of cultural ethnic backgrounds and varying physical and mental abilities.

Required knowledge

Required knowledge for this unit is:

- air psychometrics and the use of psychometric charts
- Australian and New Zealand standards, manufacturer specifications, Building Code of Australia and other applicable codes or standard operating procedures relevant to the sector
- compliance with OHS and organisational quality procedures and processes
- hazards associated with devices and systems used in the hydraulic sector
- heat load calculations
- installation methods used in hydraulic systems
- nature of materials and effect of performance
- terminology and definitions used in hydraulic design
- work drawings and specifications.

Evidence Guide

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment

This unit of competency could be assessed in the workplace or a close simulation of the workplace environment providing that simulated or project-based assessment techniques fully replicate plumbing and services workplace conditions, materials, activities, responsibilities and procedures.

This unit of competency could be assessed by:

- developing an air conditioning and ventilation system for a given project, including the schedule of works and job specification
- preparing a graphical presentation of an air conditioning or ventilation system solution with specifications.

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

A person who demonstrates competency in this unit must be able to provide evidence of:

- establishing and evaluating design parameters for a range of air conditioning and ventilation systems
- planning system components for a range of air conditioning and ventilation systems, including:
 - air conditioning units
 - ducting systems
 - fans
 - zones
- designing and sizing a range of air conditioning and ventilation systems for given applications
- developing an appropriate checklist for tests to be carried out on the system, including formulas required to carry out an air balance
- conducting tests, recording and evaluating test results and preparing a report
- preparing plans for a range of air conditioning and ventilation systems
- preparing specifications for air conditioning

EVIDENCE GUIDE

and ventilation systems

- preparing testing and commissioning schedules for air conditioning and ventilation systems
- preparing operation and maintenance manuals for air conditioning and ventilation systems.

Context of and specific resources for assessment

This competency is to be assessed using standard and authorised work practices, safety requirements and environmental constraints.

Assessment of essential underpinning knowledge will usually be conducted in an off-site context.

Assessment is to comply with relevant regulatory or Australian standards' requirements.

Resource implications for assessment include:

- an induction procedure and requirement
- realistic tasks or simulated tasks covering the minimum task requirements
- relevant specifications and work instructions
- tools and equipment appropriate to applying safe work practices
- support materials appropriate to activity
- workplace instructions relating to safe working practices and addressing hazards and emergencies
- material safety data sheets
- research resources, including industry related systems information.

Reasonable adjustments for people with disabilities must be made to assessment processes where required. This could include access to modified equipment and other physical resources, and the provision of appropriate assessment support.

Method of assessment

Assessment methods must:

- satisfy the endorsed Assessment Guidelines of the Construction, Plumbing and Services Training Package
- include direct observation of tasks in real or simulated work conditions, with questioning to confirm the ability to consistently identify and correctly interpret the essential underpinning

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knowledge required for practical application

- reinforce the integration of employability skills with workplace tasks and job roles
- confirm that competency is verified and able to be transferred to other circumstances and environments.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice, with a decision on competency only taken at the point when the assessor has complete confidence in the person's demonstrated ability and applied knowledge
- all assessment that is part of a structured learning experience must include a combination of direct, indirect and supplementary evidence.

Assessment processes and techniques should as far as is practical take into account the language, literacy and numeracy capacity of the candidate in relation to the competency being assessed.

Supplementary evidence of competency may be obtained from relevant authenticated documentation from third parties, such as existing supervisors, team leaders or specialist training staff.

Range Statement

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, if used in the performance criteria, is detailed below. Essential operating

RANGE STATEMENT

conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Work scope may include:

- documentation of layout of pipework and fixtures
- interpretation of plans and specifications for an appropriate building and size
- types of products and services, quantities, characteristics, sizes, patterns, dimensions, location, surfaces and compatibility.

Specific use conditions include:

- age and activity of occupants
- computer requirements
- wet-bulb and dry-bulb temperature and humidity.

Psychometric evaluation includes:

- absolute, specific and relative humidity
- air composition
- air properties, including:
 - density
 - expansion coefficient
 - kinematic viscosity
 - Prandtl number
 - specific heat
 - temperature
 - thermal conductivity
- altitude, density and volume
- determination of the air condition using a psychometric or Mollier chart, showing:
 - dewpoint temperature
 - dry-bulb temperature
 - enthalpy
 - humidity ratio
 - relative humidity
 - specific volume
 - wet-bulb temperature.

Calculation of heat loads includes:

- assessment of factors affecting heat load, including:
 - insulation
 - number of personnel
 - number of windows

RANGE STATEMENT

- room dimensions
- usage
- weather effects
- using:
 - calculation using software systems
 - heat load calculation methods and formulas
 - manual calculation.

Building heat losses may include:

- construction materials
- insulation materials
- maintaining plenum
- occupancy
- room sizes.

Legislation, standards and other relevant documentation is to be in accordance with federal, state and territory legislation and regulations and may include:

- OHS requirements, including:
 - growth and distribution of *Legionella pneumophila* bacteria and other water and airborne infectious bacterial agents
 - handling of materials, including hazardous materials and substances
 - hazard control
 - organic and inorganic contaminants
 - personal protective clothing and equipment
 - use of first aid equipment
 - use of tools and equipment
 - workplace environment and safety
- environmental requirements, including water quality management, which may include the breeding of mosquitoes
- quality assurance requirements, including:
 - AS1100 Technical drawing materials
 - AS1668 Ventilation systems: Parts 1 and 2
 - AS1677 Refrigerating systems
 - AS3666 Handling microbial systems
 - Environment Protection Authority
 - internal company quality assurance policy and risk management strategy
 - International Standards Organisation
 - site safety plan
 - workplace operations and procedures
- specifications and operational manuals for:

RANGE STATEMENT

	• commissioning and testing • components installation • fittings • manufacturer specifications, literature and data • materials • pumps • systems • valves.
<i>Specifications</i> may include:	• durability • fire rating requirements • longevity • type of application.
<i>Applications</i> include:	• amenities • residential, industrial and commercial applications.
<i>Designed and sized</i> include:	• designs that are prescriptive and include detail relating to: • cost • materials and quality of work • milestones • nominated subcontractors • provision of on-site facilities and site access • quality assurance • standard procedures • work schedules • design parameters may include: • client requirements • legislative requirements • OHS requirements • user requirements in relation to zoning • design and sizing to be completed: • using appropriate software • with reference to calculations, tables, regulations and manufacturer specifications.
<i>Tests and testing equipment</i> include:	• air pressure • air velocity

RANGE STATEMENT

- air volume
- humidity
- Pitot tubes
- sound power levels
- temperature.

Unit Sector(s)

Unit sector Plumbing and services

Co-requisite units

Co-requisite units Nil

Functional area

Functional area