

Unit of Competency CPCPMS5011

Design air conditioning and ventilation systems

Application

This unit applies to individuals responsible for the evaluation and design of air conditioning and ventilation systems.

The unit requires application of technical skills and knowledge to design, size and document details for complex air conditioning and ventilation systems for residential and commercial applications.

The role may involve interaction with architects, builders, suppliers, clients and relevant planning authorities and requires a sound understanding of applicable legislation, standards and codes.

The unit requirements are typically carried out by a consultant or person in a supervisory capacity in relation to plumbing services and hydraulics.

It applies to those who design air conditioning on a new project or an existing structure.

In some jurisdictions, this unit of competency may form part of accreditation, licensing, legislative, and regulatory or certification requirements.

Prerequisite Unit

Nil.

Elements and Performance Criteria

1. Evaluate design parameters.	<ul style="list-style-type: none">1.1 Clarify and establish scope of work for the design of air conditioning and ventilation systems.1.2 Determine design requirements using relevant Australian standards, codes, plans, specifications, manufacturer instructions and client briefs, including factors that contribute to quality, safety and time efficiency.1.3 Apply sustainability principles and concepts throughout the design.1.4 Evaluate user comfort and specific use conditions to calculate psychrometric evaluation and heat loads.1.5 Evaluate building heat losses.1.6 Specify distribution requirements for air conditioning and ventilation system applications.1.7 Evaluate air conditioning and ventilation systems according to given applications.1.8 Evaluate and interpret mechanical services drawings.1.9 Evaluate health risks that may arise due to poor maintenance of air conditioning and ventilation systems.1.10 Specify minimum performance requirements for several different air conditioning and ventilation systems.1.11 Evaluate the suitability of manufacturer specifications and technical manuals for a range of design applications.1.12 Carry out research including a desktop study to outline design parameters.
--------------------------------	---

	1.13 Consider the safety of system users or building occupants.
2. Plan system components.	2.1 Plan appropriate zoning of air conditioning and ventilation systems to comply with performance objectives. 2.2 Specify air conditioning units for optimum performance. 2.3 Specify fan types for a range of applications. 2.4 Plan air diversion systems, including registers, to ensure a balanced system. 2.5 Plan ventilation and duct work components and specify locations. 2.6 Specify approved materials for planned design. 2.7 Complete plans and drawings using relevant Australian standards, codes, manufacturer installation requirements and drawing symbols.
3. Design and size systems.	3.1 Calculate volume of air changes per hour from given floor plans and details. 3.2 Specify methods for eliminating health risks from existing or proposed systems, with reference to relevant authority. 3.3 Design and size air conditioning and ventilation systems for the required applications.
4. Prepare documentation.	4.1 Prepare client brief for the selected design. 4.2 Prepare plans and specifications for of air conditioning and ventilation systems. 4.3 Develop an appropriate checklist, including the formulas required to carry out an air balance to a given specification. 4.4 Prepare a testing and commissioning schedule.
5. Test systems.	5.1 Evaluate test procedures for air conditioning and ventilation. 5.2 Conduct tests using appropriate testing equipment, ensuring tests are conducted for air pressure, air velocity, air volume, humidity, pitot tubes, sound power levels and temperature. 5.3 Record test results and prepare a report. 5.4 Design, plan and specify adjustments as required. 5.5 Produce an operation and maintenance manual.

Foundation skills

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Unit Mapping Information

Supersedes and is equivalent to CPCPMS5011A Design air conditioning and ventilation systems.

Links

Companion Volume Implementation Guide:

<https://vetnet.education.gov.au/Pages/TrainingDocs.aspx?q=7e15fa6a-68b8-4097-b099-030a5569b1ad>

Assessment Requirements for CPCPMS5011 Design air

conditioning and ventilation systems

Performance Evidence

To demonstrate competency, a candidate must meet the performance criteria for this unit by:

- designing, sizing and documenting the layout details for an air conditioning and ventilation system for a 10-storey residential building with ground floor commercial premises and basement car park and include:
 - air conditioning units
 - ducting systems
 - controls
 - fans
 - zones.

Knowledge Evidence

To be competent in this unit, a candidate must demonstrate knowledge of:

- methods of determining scope of work by:
 - interpreting plans and specifications
 - reviewing sizing and documenting layout for air conditioning and ventilation systems, including residential and commercial systems
 - analysing new projects or an existing structure being renovated, extended, restored or maintained
- design requirements:
 - architectural plans
 - building specifications
 - fire safety
 - the National Construction Code (NCC)
 - owners
 - tenants
 - air-flow requirements and sizing of duct work
- specific use conditions:
 - age and activity of occupants
 - computer requirements
 - food preparation
 - smoke exhaust
 - wet-bulb and dry-bulb temperature and humidity
- psychrometric evaluation:
 - absolute, specific and relative humidity
 - air composition
 - air properties:
 - density

- expansion coefficient
 - kinematic viscosity
 - Prandtl number
 - specific heat
 - temperature
 - thermal conductivity
- altitude, density and volume
- determination of the air condition using a psychrometric or Mollier chart, showing:
 - o dewpoint temperature
 - o dry-bulb temperature
 - o enthalpy
 - o humidity ratio
 - o relative humidity
 - o specific volume
 - o wet-bulb temperature
- assessment of factors affecting heat load:
 - o building materials
 - o insulation
 - o number of personnel
 - o number of windows
 - o room dimensions
 - o usage
 - o weather effects
- using:
 - o calculations and computer software systems
 - o heat load calculation methods and formulas
- building heat losses:
 - o construction materials
 - o insulation materials
 - o maintaining plenum
 - o occupancy
 - o room sizes
- legislation, standards and other relevant documentation according to Commonwealth, state and territory legislation and regulations relating to:
 - o growth and distribution of Legionella pneumophila bacteria and other water and airborne infectious bacterial agents
 - o handling of materials, including hazardous materials and substances
 - o hazard control
 - o organic and inorganic contaminants
- quality assurance requirements, including:
 - o AS 1100 Technical drawing materials
 - o AS/NZS 1668 The use of ventilation and air-conditioning in buildings Set
 - o AS/NZS ISO 817:2016 Refrigerants – Designation and safety classification

- o AS/NZS 5149 Refrigerating systems and heat pumps – Safety and environmental requirements - Parts 1 to 4
 - o AS/NZS 3666 Air-handling and water systems of buildings microbial control - Parts 1 to 4
 - o Environment Protection Authority (EPA)
 - o internal company quality assurance policy and risk management strategy
 - o International Standards Organisation (ISO)
 - o site safety plan
 - o workplace operations and procedures
- specification and operational manual information:
 - o commissioning and testing
 - o components installation
 - o fittings
 - o manufacturer specifications, literature and data
 - o materials
 - o pumps
 - o systems
 - o valves
- specification:
 - o air-flow requirements
 - o equipment selection
 - o fire safety
 - o jointing
 - o manufacturer requirements
 - o materials
 - o work health and safety (WHS)
 - o specialised components
 - o support
 - o testing
 - o workmanship
- plans:
 - o axonometric
 - o cross-sections
 - o details
 - o elevations
 - o isometrics
 - o schematics
 - o sections
- plans produced by:
 - o computer generation
 - o drawing equipment
- design and sizing detail:
 - o cost
 - o materials and quality of work

- milestones
 - nominated subcontractors
 - provision of on-site facilities and site access
 - quality assurance
 - space allowances
 - standard procedures
 - work schedules
- design parameters:
 - client requirements
 - legislative requirements
 - WHS requirements
 - user requirements in relation to zoning
 - reference to calculations, tables, regulations and manufacturer specifications
- methods of applying sustainability principles and concepts:
 - selecting appropriate material to ensure minimal environmental impact
 - efficient use of material
 - efficient energy usage
- tests and testing equipment for:
 - air pressure
 - air velocity
 - air volume
 - humidity
 - pitot tubes
 - sound power levels
 - temperature
 - air flow
 - climate control
 - defect inspection
 - performance quality assurance (QA) audit
- commissioning schedule information:
 - acoustic performance
 - balancing
 - system certification
 - check for foreign material
 - leak check
 - system defects
 - system functions as per design
- operation and maintenance manual information:
 - as installed drawing
 - certification documentation
 - results of commissioning test
 - maintenance schedules
 - manufacturer brochures and technical information

- o regular water quality testing
- o system operation.

Assessment Conditions

Assessors must satisfy the requirements for assessors listed in the Standards for Registered Training Organisations.

This unit must be assessed in the workplace or a close simulation using realistic workplace conditions, materials, activities, responsibilities, procedures, safety requirements and environmental considerations.

Links

Companion Volume Implementation Guide:

<https://vetnet.education.gov.au/Pages/TrainingDocs.aspx?q=7e15fa6a-68b8-4097-b099-030a5569b1ad>