

# Unit of Competency CPCPCM5011

## Design complex cold water systems

### Application

This unit specifies the skills and knowledge required to design complex cold water distribution systems in commercial and high-rise mixed development building to a minimum of 29 floors inclusive of a basement. The unit requires application of technical skills and knowledge to design and size systems and prepare operational and compliance documentation.

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.

This unit requirements are typically carried out by a consultant or design engineer.

Application of the unit is relevant to multi-storey residential, commercial and industrial buildings with or without connection to reticulated water supply.

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

### Prerequisite Unit

Nil.

### Elements and Performance Criteria

1. Evaluate design parameters.	<ul style="list-style-type: none"><li>1.1 Identify and establish scope of work from preliminary information and in consultation with associated persons.</li><li>1.2 Determine design parameters from relevant Australian Standards, codes, plans, specifications, statutory and regulatory requirements and client brief.</li><li>1.3 Apply sustainability principles and concepts as part of the design process.</li><li>1.4 Establish performance requirements, considering safety of system users or building occupants.</li><li>1.5 Determine available pressure and flow rates at site location.</li><li>1.6 Conduct research, including a desktop study to outline design parameters.</li><li>1.7 Interpret manufacturer requirements and trade and technical manuals.</li><li>1.8 Conduct a cost-benefit analysis to compare a range of materials and system designs.</li></ul>
2. Plan and detail system components.	<ul style="list-style-type: none"><li>2.1 Plan layout of pipework systems, including the type and location of fittings and valves and acoustic performance of the system.</li><li>2.2 Detail type, location and requirements for backflow prevention devices.</li><li>2.3 Specify flush valve system types and operation.</li><li>2.4 Calculate pipe sizes, velocities, flows and residual pressures for a range of applications.</li><li>2.5 Detail or design cold water system components.</li><li>2.6 Size and detail pump, pump controls and pump room requirements.</li><li>2.7 Specify approved materials, jointing methods and installation requirements.</li></ul>

3. Design and size systems.	3.1 Design systems for a range of wide-span and high-rise building applications. 3.2 Design flush valve distribution systems for sanitary ablutions. 3.3 Design a range of delivery systems. 3.4 Design and size complex cold water distribution systems using computer software packages. 3.5 Design water storage and break tanks. 3.6 Design cold water pressure systems and incorporate into building supply system. 3.7 Design backflow penetration systems associated with cold water systems. 3.8 Calculate pipe sizes, velocities and pressures. 3.9 Calculate system pressures, pressure losses and pressure reduction measures.
4. Prepare documentation.	4.1 Prepare client brief for the preferred design. 4.2 Prepare plans and specifications for designing complex cold water systems. 4.3 Prepare testing and commissioning schedule. 4.4 Produce operation and maintenance manual for maintaining cold water systems.

## 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 CPCPCM5011A Design complex cold water systems.

## Links

Companion Volume Implementation Guide:

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

# Assessment Requirements for CPCPCM5011

## Design complex cold water systems

### Performance Evidence

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

- designing, sizing and documenting the layout details of two methods of providing a cold water supply for a high-rise mixed development building to a minimum of 29 floors inclusive of a basement, including:
  - fixtures on each level
  - a non-drinking supply system
  - a flush valve system
- planning system detail components, including:
  - authorities' connection
  - backflow prevention requirements
  - fixtures and fitments
  - flush valves
  - meter assemblies
  - storage tanks
  - piping systems
  - pumps
- applying sustainability principles and concepts throughout to achieve a star rating under the Green Building Council of Australia rating scheme
- evaluating health risks associated with drinking and non-drinking water supplies and actioning as required within the system design.

### Knowledge Evidence

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

- AS/NZS 3500 Plumbing and drainage set
- AS 2200 Design charts for water supply and sewerage
- common terminology and definitions used in design of cold water reticulation systems
- National Construction Code (NCC)
- local and state government requirements
- preparation of documentation for authorities' approval
- nature of materials used and the effects of performance under various conditions
- other relevant Australian Standards, codes or standard operating procedures
- principles of technology used in design of cold water reticulation and hydrant and hose reel systems for all classes of building

- requirements of state regulatory authorities and manufacturer specifications, including hazards identified in relation to devices and systems used
- water quality requirements
- work health and safety (WHS) requirements, including relevant statutory regulations, codes and standards
- methods to apply sustainability principles and concepts:
  - selecting appropriate material to ensure minimal environmental impact
  - efficient use of material
  - efficient energy usage/capital outlay comparison
  - effect on the environment due to overflow or leakage
  - water efficiency
  - consideration of the Green Building Council of Australia rating scheme
- information on design requirements:
  - architectural plans
  - building specifications
  - effect of water quality on pipework, plant and equipment
  - owner requirements
  - pipework and valve identification
  - soil quality
  - specialist water use applications
  - unstable or water-charged ground
- specifications for:
  - bedding
  - flow requirements
  - jointing
  - manufacturer requirements
  - materials
  - residual pressures
  - WHS
  - specialised components
  - support
  - testing
  - valve selection
  - water treatment
  - workmanship
- locating information on systems and components from a variety of sources such as:
  - manufacturer's websites
  - trade meetings and exhibitions
  - brochures
  - trade outlets
  - other design projects
- cost-benefit analysis considerations for the selection of materials and system:
  - enabling cost effective choices without compromising the integrity of the project

- expected design life
  - associated labour costs
  - material costs
  - safety factors
  - speed of installation
  - suitability of materials
  - range of system choices
- manufacturer's requirements:
  - flow and pressure requirements for fixtures and appliances
  - material specifications
  - pump tables
  - sizing tables
  - recommended specific fixings for pipework
  - technical and trade manuals
- types of plans produced using computer software and drawing equipment:
  - axonometrics
  - cross-sections
  - details
  - elevations
  - isometrics
  - schematics
  - sections
- flow, velocity, pressure and discharge requirements, established using relevant Australian Standards, codes, and state, territory and local government authorities' plans
- layout of pipework systems:
  - principles of economy, serviceability, durability and fitness for use
  - dual feed
  - gravity feed
  - main pressure
  - pumped system
  - ring main
- types of fittings:
  - bends
  - elbows
  - tees
  - unions
- types of valves:
  - backflow prevention
  - excess pressure
  - isolating
  - pressure limiting
  - pressure reduction
  - strainers

- backflow prevention devices:
  - registered break tank (RBT)
  - registered air gap (RAG)
  - double-check valve assembly (DCV)
  - dual-check valve with intermediate vent (DuCV)
  - reduced pressure detector assembly (RPDA)
  - reduced pressure zone device (RPZD)
  - other approved devices
- types of flush valve systems:
  - backflow prevention requirements
  - gravity
  - mains pressure
  - pipe sizing requirements
  - storage requirements
- cold water system meter assemblies:
  - direct and indirect
  - electronic
  - inferential
  - magnetic
- thrust blocks and their design elements:
  - design details for tees, elbows and valves
  - keying and anchorage points
  - sizes
  - soil characteristics
  - velocity and flow forces to be resisted
- range of pipe supports:
  - anchors
  - bedding
  - bracket spacing
  - corrosion protection
  - cover
  - hanging brackets
  - manufacturer-recommended specific fixings
  - material requirements
  - provision for expansion
  - saddles
  - wall and ceiling brackets
- considerations for water storage systems:
  - air gap
  - automatic controls
  - drain down provision
  - inlet valve design and sizing
  - outlet sizing

- o overflow requirements
  - o provision to maintain service while cleaning
  - o provision to maintain service while servicing
  - o safe tray requirements
  - o tank access
  - o tank maintenance
  - o tank sizes
- water treatment:
  - o filtration
  - o reverse osmosis (RO)
  - o softening
- pump, pump controls and pump room requirements:
  - o acoustic performance
  - o automatic changeover
  - o automatic controls
  - o drain down provision
  - o dual pump provision
  - o impeller sizing
  - o inlet and outlet design requirements
  - o installation and mounting requirements
  - o pressure gauges
  - o pump selection
  - o pump sizing
  - o space requirements
  - o valve requirements
  - o variable speed control
- materials:
  - o acrylonitrile butadiene styrene (ABS)
  - o composite pipework
  - o copper (Cu)
  - o cross-linked polyethylene (PE-X)
  - o polypropylene (PP)
  - o polybutylene (PB)
  - o ductile iron cement lined (DICT)
  - o other approved materials
  - o fittings and fixtures
  - o protective coatings
- jointing methods:
  - o brazing
  - o compression
  - o electrofusion welding
  - o flaring
  - o mechanical joints

- o rubber ring joints
  - o screwing
  - o soldering
  - o solvent cement welding
  - o other approved jointing methods
- installation requirements:
  - o bedding
  - o fire rating of penetrations
  - o clipping
  - o installation details
  - o jointing requirements
  - o level of workmanship
  - o manufacturer-recommended specific fixings
  - o pipe support
- delivery systems:
  - o constant flow variable speed pumps
  - o gravity feed
  - o hydropneumatic
  - o mains pressure system
- testing:
  - o air pressure
  - o defect inspection
  - o hydrostatic
  - o mains pressure
  - o performance
  - o quality assurance (QA) audit
- commissioning schedule inclusions:
  - o disinfection
  - o flow test
  - o leak check
  - o pressure test
  - o system certification
  - o system defects
  - o system functions as per design
  - o system purge
  - o valve operation
- operation and maintenance manual inclusions:
  - o as installed drawings
  - o certification documentation
  - o maintenance schedules
  - o manufacturer brochures and technical information
  - o results of commissioning test
  - o valve function.



## 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>