



**Australian Government**

**Department of Education, Employment and Workplace Relations**

# **CPCPCM5001A Design complex cold water systems**

**Release: 1**

## CPCPCM5001A Design complex cold water systems

### Modification History

Not Applicable

### Unit Descriptor

**Unit descriptor** This unit of competency specifies the outcomes required to design complex cold water distribution systems in multi-storey buildings, including upfeed, downfeed, pumped systems and storage regulations.

### Application of the Unit

**Application of the unit** This unit of competency supports development of skills and knowledge required for competent workplace performance in a consultancy or supervisory capacity in relation to plumbing services and construction hydraulics.

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

### Licensing/Regulatory Information

Not Applicable

### Pre-Requisites

**Prerequisite units** Nil

## Employability Skills Information

**Employability skills**      This unit contains employability skills.

## Elements and Performance Criteria Pre-Content

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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.	<p>1.1. <b>Scope of work</b> is established for the distribution of complex cold water systems for wide span and high-rise building projects.</p> <p>1.2. <b>Design requirements</b> are determined from plans, specifications and client briefs.</p> <p>1.3. <b>Cost-benefit analysis</b> is conducted, comparing a range of pipe materials and system designs.</p> <p>1.4. <b>Statutory and regulatory requirements</b> for the design of complex cold water distribution systems are interpreted.</p> <p>1.5. <b>Australian and New Zealand standards</b> for the design of complex cold water distribution systems are analysed and applied.</p> <p>1.6. <b>Manufacturer requirements</b> and trade and technical manuals are interpreted.</p> <p>1.7. Additional research, including a <b>desktop study</b>, is conducted to outline design parameters.</p> <p>1.8. Flow and pressure tests are conducted.</p> <p>1.9. Performance requirements are established.</p>
2. Plan and detail system components.	<p>2.1. Layout of pipework systems and type and location of fittings and valves are planned.</p> <p>2.2. Type, location and requirements for <b>backflow prevention devices</b> are detailed.</p> <p>2.3. <b>Flush valve system types</b> and operation are specified.</p> <p>2.4. Pipe sizes, velocities, flows and pressures are calculated for a range of applications.</p> <p>2.5. Cold water system components are detailed or designed.</p> <p>2.6. Pump, pump controls and pumphouse requirements are sized and detailed.</p> <p>2.7. Approved <b>materials, jointing methods</b> and <b>installation requirements</b> for complex cold water distribution systems are specified.</p>
3. Design and size systems.	<p>3.1. Complex cold water distribution systems are designed for a range of wide span and high-rise building applications.</p> <p>3.2. Flush valve distribution systems are designed.</p> <p>3.3. Range of <b>delivery systems</b> is designed.</p> <p>3.4. Complex cold water distribution systems are</p>

ELEMENT	PERFORMANCE CRITERIA
4. Prepare documentation.	<p>designed and sized using computer software packages.</p> <p>4.1. <b>Plans</b> are prepared for a range of complex cold water distribution systems.</p> <p>4.2. <b>Specification</b> for a cold water distribution system is prepared.</p> <p>4.3. Testing and commissioning schedule is prepared.</p> <p>4.4. Operation and maintenance manual is produced.</p>

## 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:
  - confirm job specifications and client requirements
  - communicate with others to ensure safe and effective work practices
  - enable clear and direct communication, using questioning to identify and confirm requirements, share information, listen and understand
  - prepare documentation, including plans, specifications and schedules
  - produce operation and maintenance manual
  - read and interpret:
    - plans, specifications, drawings and design briefs
    - standards and manufacturer requirements and manuals
    - statutory and regulatory requirements
  - use language and concepts appropriate to cultural differences
  - use and interpret non-verbal communication, such as hand signals
- identifying and accurately reporting to appropriate personnel any faults in tools, equipment or materials
- innovation skills to develop creative and responsive approaches
- planning and organisational skills to:
  - research, collect, organise and understand information relating to the design of complex cold water systems
  - take initiative and make decisions
- problem solving skills to analyse requirements, consider options and design an

## **REQUIRED SKILLS AND KNOWLEDGE**

appropriate system

- teamwork skills to work with others to action tasks and relate to people from a range of cultural and ethnic backgrounds and with varying physical and mental abilities
- technological skills to:
  - access and understand site-specific instructions in a variety of media
  - use mobile communication technology.

### **Required knowledge**

Required knowledge for this unit is:

- AS/NZS3500 National plumbing and drainage set
- AS2200 Design charts for water supply and sewerage
- common terminology and definitions used in design of cold water reticulation systems
- nature of materials used and effects of performance under various conditions
- other 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, Australian standards and manufacturer specifications, including hazards identified in relation to devices and systems used
- workplace safety requirements, including relevant statutory regulations, codes and standards.

# Evidence Guide

## EVIDENCE GUIDE

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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.

It may be assessed on its own or as part of an integrated assessment activity involving effective performance and application of drainage principles and detailing of system components used in the drainage industry.

### 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:

- evaluating and documenting design parameters, including client, regulatory, manufacturer and Australian and New Zealand standard requirements for a range of complex sanitary plumbing and drainage systems
- applying regulatory, manufacturer and Australian and New Zealand requirements for a range of complex cold water distribution systems
- planning and detailing system components, including:
  - flush valves
  - backflow prevention devices
  - meter assemblies
  - thrust blocks
  - piping systems
- complying with OHS regulations applicable to workplace operations
- applying organisational quality procedures and processes
- designing and sizing a range of cold water distribution and delivery systems
- designing and sizing a range of flush valve

## EVIDENCE GUIDE

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systems

- preparing plans for a range of complex cold water distribution systems
- preparing a specification for a cold water distribution system
- preparing a testing and commissioning schedule
- preparing an operation and maintenance manual
- applying correct design principles and techniques
- identifying typical faults and problems that occur and taking action necessary to rectify
- interactive communication with others to ensure safe and effective workplace operations.

### 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,



## EVIDENCE GUIDE

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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 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

## EVIDENCE GUIDE

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staff.

## Range Statement

### RANGE STATEMENT

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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 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.

***Scope of work:***

- includes interpretation of plans and specifications
- includes sizing and documenting layout of complex cold water systems for applications including residential, commercial and industrial
- may be for new projects or an existing structure being renovated, extended, restored or maintained.

***Design requirements*** may include:

- architectural specifications
- builder specifications
- owner requirements
- specialist water use applications.

***Cost-benefit analysis*** may include:

- comparison of range of suitable materials and system choices available to enable cost-effective choices to be made without compromising the integrity of the project.

***Statutory and regulatory requirements*** may include:

- Acts and regulations
- local and state government policies.

***Australian and New Zealand standards*** may include:

- AS/NZS3500 National plumbing and drainage set: Parts 1.1 and 1.2
- AS2200 Design charts for water supply and sewerage
- Building Code of Australia.

***Manufacturer requirements*** may include:

- material specifications
- pump tables
- sizing tables

## RANGE STATEMENT

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- Desktop study*** can include collection and interpretation of existing data for design purposes from:
- technical and trade manuals.
  - architectural and building plans
  - council plans
  - developer plans
  - other documents and reports as available.
- Flow and pressure tests*** include:
- on-site measurement of flow (l and s), velocity (m and s) and pressure (kPa)
  - interpretation of flow and pressure tests conducted by a contractor.
- Performance requirements*** may include:
- flow, velocity, pressure and discharge requirements, established using Australian and New Zealand standards and local authority plans.
- Layout of pipework systems*** may include:
- dual feed
  - ring main
  - single pipe.
- Fittings and valves*** may include:
- fittings:
    - bends
    - elbows
    - tees
    - unions
  - valves:
    - backflow prevention
    - excess pressure
    - isolating
    - pressure limiting
    - pressure reduction
    - strainers.
- Backflow prevention devices*** may include:
- break tanks
  - property and individual protection
  - testable and non-testable devices
  - zone protection.
- Flush valve system types*** may include:
- backflow prevention requirements
  - gravity
  - mains pressure
  - pipe sizing requirements
  - storage requirements.
- Cold water system components*** cover:
- meter assemblies, including:
    - direct and indirect

## RANGE STATEMENT

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- electronic
- inferential
- magnetic
- thrust blocks and their design elements, including:
  - design details for tees, elbows, valves and meter assemblies
  - keying and anchorage points
  - sizes
  - soil characteristics
  - velocity and flow forces to be resisted
- pipe fixings, including:
  - anchors
  - bedding
  - bracket spacing
  - corrosion protection
  - cover
  - hanging brackets
  - material requirements
  - saddles
  - wall and ceiling brackets
- water storage systems, including:
  - automatic controls
  - inlet valve design and sizing
  - outlet sizing
  - overflow requirements
  - safe tray requirements
  - tank sizes.

***Pump, pump controls and pumproom requirements*** may include:

- automatic controls
- impeller sizing
- inlet and outlet design requirements
- installation and mounting requirements
- pump selection
- pump sizing
- space requirements
- valve requirements.

***Materials*** include:

- acrilonitrile butadiene styrene (ABS)
- composite pipework
- copper

## RANGE STATEMENT

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- cross-linked polyethylene
  - fittings and fixtures
  - polybutylene
  - protective coatings
  - steel.
- Jointing methods** may include:
- brazing
  - compression
  - flaring
  - mechanical joints
  - rubber ring joints
  - screwing
  - soldering.
- Installation requirements** include:
- bedding
  - clipping
  - installation details
  - jointing requirements
  - level of workmanship.
- Delivery systems** may include:
- constant flow variable speed pumps
  - downfeed
  - hydropneumatic
  - pressure ratio
  - upfeed.
- Plans** include:
- axonometrics
  - cross-sections
  - details
  - elevations
  - isometrics
  - schematics
  - sections.
- Specification** may include:
- bedding
  - clipping
  - jointing
  - manufacturer
  - materials
  - specialised components
  - valve selection
  - workmanship.
- Testing** may include:
- air pressure test
  - defect inspection
  - hydrostatic test

## RANGE STATEMENT

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*Commissioning schedule* may include:

- mains pressure test
- quality assurance (QA) audit.
- flow test
- leak check
- pressure test
- system purge
- valve operation.

*Operation and maintenance manual* may include:

- leak detection
- pump maintenance
- valve maintenance
- water auditing
- yearly inspection
- yearly maintenance requirements.

## Unit Sector(s)

Unit sector                      Plumbing and services

## Co-requisite units

Co-requisite units              Nil

## Functional area

Functional area