

Unit of Competency CPCPCM5013

Design complex (non-solar) heated water systems

Application

This unit specifies the skills and knowledge required to design complex (non-solar) heated water supply and distribution systems for buildings with 29 floors, inclusive of basement and fixtures on each level for residential, commercial and industrial applications. The unit includes circulating systems, fuel and energy loads and system selection.

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

This unit's requirements are typically carried out by experienced tradespeople such as hydraulic design consultants or persons in a supervisory capacity in relation to plumbing services.

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">1.1 Establish scope of work for heated water supply and distribution systems from relevant Australian Standards, codes, plans, specifications and client brief.1.2 Analyse and apply statutory and regulatory requirements for the design of complex (non-solar) heated water supply and distribution systems.1.3 Apply sustainability principles and concepts as part of the design process.1.4 Establish performance requirements considering the safety of system users and building occupants, including the control of Legionella bacteria.1.5 Conduct research, including a desktop study to outline design parameters.1.7 Interpret manufacturer requirements and trade and technical manuals for the design of heated water systems.1.8 Conduct a cost-benefit analysis to compare a range of materials and system designs.
2. Plan and detail system components.	<ul style="list-style-type: none">2.1 Plan layout of pipework systems and type and location of fittings and valves.2.2 Detail thermostatic mixing, tempering and control valves for a range of applications using appropriate symbols.2.3 Plan and detail circulating heated water supply systems.2.4 Plan and detail warm water systems, including disinfection and biocontrol measures.2.5 Conduct calculations to determine water heating sizing and detail methods for the control of expansion.2.6 Calculate pipe sizes and design pipe supports for a range of applications.2.7 Detail manifolded heated water units for a range of water heaters and specify safe trays and overflows.

	2.8 Specify approved materials and jointing methods and insulation materials and installation requirements for a range of water heaters and heated water systems. 2.9 Provide allowance for expansion and contraction. 2.10 Include acoustic performance of the system in plans.
3. Design and size systems.	3.1 Design complex (non-solar) heated water supply and distribution systems using plans and details of system components and established design parameters. 3.2 Design suitable system approaches. 3.3 Design and size system using manufacturer's design information and calculations. 3.4 Calculate pipe sizes, velocities and pressures according to manufacturer's piping design requirements.
4. Prepare documentation	4.1 Prepare client brief of the preferred design. 4.2 Prepare plans and specifications. 4.3 Prepare testing and commissioning schedule. 4.4 Produce 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 CPCPCM5013A Design complex (non-solar) heated water systems.

Links

Companion Volume Implementation Guide:

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

Assessment Requirements for CPCPCM5013

Design complex (non-solar) heated water systems

Performance Evidence

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

- designing, sizing and planning the layout details for complex (non-solar) heated water systems for a high-rise mixed development building to a minimum of 29 floors inclusive of a basement, including fixtures on each level and using two methods of providing heated water:
 - one system to be gas only
 - one system incorporating an alternative energy efficient heat source, for example, a commercial heat pump with boosted system
- preparing documentation, including:
 - heat source
 - flue arrangements
 - flow and return systems
 - insulation requirements
 - manifold systems
 - provision for expansion
 - temperature control device
- 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 heated water supplies and actioning as required within the system design.

Knowledge Evidence

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

- common terminology and definitions used in design of complex (non-solar) heated water systems
- application of National Construction Code (NCC), relevant Australian Standards, codes and manufacturer specifications, including:
 - Acts and regulations
 - AS/NZS 3500 Plumbing and drainage set
 - local government and health department requirements
- installation methods and hazards identified in relation to devices and systems used according to relevant Australian Standards, codes and standard operating procedures
- nature of materials used and effects of performance under various conditions

- work health and safety (WHS) requirements, including relevant statutory regulations, codes and standards
- cost-benefit analysis considerations for the selection of materials and systems:
 - enabling cost effective choices without compromising the integrity of the project
 - expected design life
 - design style
 - associated labour costs
 - material costs
 - safety factors
 - speed of installation
 - suitability of materials
 - range of system choices
- requirements from manufacturer:
 - material specifications
 - heater maintenance and servicing
 - provision for heater pressure and temperature discharge
 - pump tables
 - sizing tables
 - recommended specific fixings for pipework
 - technical and trade manuals
- sources of information to support the design process:
 - architectural and building plans
 - developer plans
 - building applications
 - brochures
 - forms
 - policies
 - other reports as available
- layout of pipework systems:
 - dead leg
 - pressurised
 - thermo convection
 - circulating
- types of fittings:
 - bends
 - tees
 - unions
- types of valves:
 - backflow prevention
 - cold water expansion
 - isolating
 - non-return, including high pressure non-return
 - pressure limiting

- o pressure relief
 - o strainers
 - o temperature control
- types of thermostatic mixing and tempering valves:
 - o bimetallic types
 - o wax capsule
- circulating heated water supply system details:
 - o circulating pump specification
 - o dead leg minimisation
 - o flow and return pipework
 - o circulation
 - o pipe insulation
 - o thermal convection circulating
- heat trace systems:
 - o installation requirements
 - o running costs
 - o serviceability
- calculations for sizing water heaters:
 - o coefficient of expansion
 - o daily flows
 - o energy consumption
 - o heat losses
 - o mixed temperatures
 - o peak demand
 - o recovery times
 - o size and quantity of heated water required
 - o standby versus continual flow
 - o tariffs
 - o water expansion
- methods for the control of expansion:
 - o U-bends
 - o coiled loop
 - o lyre bend
 - o offset bends
 - o proprietary expansion control devices
- pipe supports:
 - o anchors
 - o bracket spacing
 - o corrosion protection
 - o hanging brackets
 - o material requirements
 - o provision for expansion
 - o saddles

- o wall and ceiling brackets
- manifolded heated water units:
 - o balanced flow conditions and valves
 - o pressure relief requirements
- water heater inclusions:
 - o continuous flow
 - o heat transfer
 - o pressure storage systems
 - o open vented storage systems
- sources of generated heat:
 - o electricity
 - o gas
 - o heat pump
 - o solar
 - o solid fuel
 - o waste heat
- safe trays and overflows:
 - o design
 - o discharge
 - o materials
 - o sizes
- materials:
 - o pipe materials as specified:
 - copper
 - composite
 - polymer
 - other approved materials
 - o flue materials including stainless steel
 - o ancillary material:
 - air relief valve
 - heaters
 - fittings and fixtures
 - insulation
 - pumps
 - valves
- jointing methods:
 - o brazing
 - o compression
 - o electrofusion welding
 - o flaring
 - o mechanical joints
 - o threading
- insulation materials:
 - o fibre glass

- o foam
 - o metal sheathing
 - o rock wool
 - o other approved materials
- installation requirements:
 - o fire rating of penetrations
 - o level of workmanship
 - o manufacturer-recommended specific fixings
 - o pipe support
 - o provision for expansion
 - o serviceability and access
- circulating systems:
 - o approved pressure pipes and fittings
 - o balancing valves
 - o circulating pump and controls
 - o isolating valves
 - o thermo cycle
 - o temperature gauge
 - o pump sizing to meet calculated flow conditions
- methods of applying sustainability principles and concepts:
 - o selecting appropriate material to ensure minimal environmental impact
 - o efficient use of material
 - o efficient energy usage/capital outlay comparison
 - o selection of energy efficient water heater
 - o water efficiency
 - o consideration of the Green Building Council of Australia rating scheme
- types of plans produced using computer software and drawing equipment:
 - o axonometrics
 - o cross-sections
 - o details
 - o elevations
 - o isometrics
 - o schematics
 - o sections
- specification:
 - o support
 - o jointing
 - o flow requirements
 - o manufacturer requirements
 - o materials
 - o residual pressures and temperature
 - o WHS
 - o specialised components

- o testing
 - o valve selection
 - o water treatment
 - o workmanship
- testing for:
 - o air pressure
 - o defect inspection
 - o flue operation
 - o hydrostatic
 - o mains pressure
 - o performance
 - o quality assurance (QA) audit
- commissioning schedule information:
 - o balancing the system
 - o checking and flushing the system
 - o disinfection
 - o flow test
 - o flue operation
 - o leak check
 - o pressure test
 - o system certification
 - o system defects
 - o system functions as per design
 - o system purge
 - o temperature setting
 - o valve operation
- operation and maintenance manual information:
 - o as installed drawings
 - o results of commissioning test
 - o certification documentation
 - o heater details, settings and operations
 - o maintenance schedules
 - o manufacturer brochures and technical information
 - 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

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