



Australian Government

Department of Education, Employment and Workplace Relations

CPCPMS5000A Design steam distribution systems

Release: 1

CPCPMS5000A Design steam distribution systems

Modification History

Not Applicable

Unit Descriptor

Unit descriptor This unit of competency specifies the outcomes required to design steam distribution systems, including sizing, material selection, and preparation and specification of steam distribution system plans.

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 hydraulics.

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

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. Scope of work is established for steam distribution systems.</p> <p>1.2. Design requirements are determined from plans, specifications and client brief.</p> <p>1.3. Cost-benefit analysis is conducted comparing a range of materials and system designs.</p> <p>1.4. Statutory and regulatory requirements and Australian and New Zealand standards for the design of steam distribution systems are analysed and applied.</p> <p>1.5. Manufacturer requirements and trade and technical manuals are interpreted.</p> <p>1.6. Additional research, including a desktop study, is conducted to outline design parameters.</p> <p>1.7. 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. Pipe size calculations are performed for a range of applications.</p> <p>2.3. Steam appliances are specified, steam consumption is calculated and boilers required are sized and specified.</p> <p>2.4. Steam circuits are detailed and distribution pressures for a range of applications are specified.</p> <p>2.5. Steam trap types and their operation are specified and detailed.</p> <p>2.6. Steam injection systems are specified.</p> <p>2.7. Insulation is specified.</p> <p>2.8. Pipe fixings are designed for a range of applications.</p> <p>2.9. Approved materials, jointing methods and all installation requirements for steam distribution systems are specified.</p>
3. Design and size systems.	<p>3.1. Steam distribution systems and steam circuits are designed for a range of applications.</p> <p>3.2. Steam distribution systems are designed and sized using computer software packages.</p>
4. Prepare documentation.	<p>4.1. Plans are prepared for a range of steam distribution systems.</p> <p>4.2. Specification for a steam distribution system is</p>

ELEMENT**PERFORMANCE CRITERIA**

prepared.

4.3. *Testing* and *commissioning schedule* is prepared.

4.4. *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
 - 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:
 - manufacturer requirements and manuals
 - plans, specifications, drawings and design briefs
 - statutory and regulatory requirements and standards
 - use language and concepts appropriate to cultural differences
 - use and interpret non-verbal communication, such as hand signals
- 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 measurements and calculations
- planning and organisational skills to:
 - plan and set out work
 - research, collect, organise and understand information relating to the design of steam distribution systems
 - take initiative and make decisions
- preparing and specifying steam distribution system plans
- problem solving skills to analyse requirements, consider options and design an 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

REQUIRED SKILLS AND KNOWLEDGE

abilities.

Required knowledge

Required knowledge for this unit is:

- common terminology and definitions used in design of steam distribution systems for all classes of building, including industry terminology, such as:
 - absolute pressure
 - enthalpy
 - enthalpy of evaporation and of saturated steam
 - enthalpy of saturated water
 - gauge pressure
 - heat and heat transfer
 - latent heat
 - specific enthalpy
 - specific heat capacity
- principles of technology in the design of steam distribution systems
- requirements of state regulatory authorities, Australian standards and manufacturer specifications, including hazards identified in relation to devices and systems used
- SI system of units related to steam
- terms, including Australian and New Zealand standard definitions, manufacturer terms and naming conventions
- workplace safety requirements, including relevant statutory regulations, codes and standards.

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.

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 steam distribution systems
- producing an appropriate layout for steam distribution systems, planned in accordance with manufacturer and regulatory requirements
- designing a steam circuit
- calculating pipe sizes in accordance with regulations and manufacturer requirements
- designing and sizing steam distribution systems using appropriate software
- preparing plans for a range of steam distribution systems
- preparing specifications for steam distribution systems
- preparing testing and commissioning schedules
- producing operation and maintenance manuals.

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.

EVIDENCE GUIDE

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 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

EVIDENCE GUIDE

- 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 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:

- barriers to heat transfer
- effects of air in a steam system
- heat transfer
- interpretation of plans and specifications, and sizing and documenting layout of steam distribution systems for residential, commercial and industrial applications for either new projects or an existing structure

RANGE STATEMENT

being renovated, extended, restored or maintained

- principles and properties of steam systems, including:
 - characteristics of condensation
 - methods of condensate removal
- steam applications, including commercial, manufacturing, institution and machinery and equipment operation
- working with types of steam and steam quality, including:
 - dry steam
 - flash steam
 - properties of steam at varying pressures
 - superheated steam
 - wet steam.

Design requirements include:

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

Cost-benefit analysis includes:

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

Statutory and regulatory requirements and Australian and New Zealand standards include:

- Acts, regulations and local and state government policies, including group and strata titling
- Australian and New Zealand standards
- Building Code of Australia.

Manufacturer requirements include:

- material specifications
- sizing tables
- technical and trade manuals.

Desktop study includes:

- collection and interpretation of existing data for design purposes from:
 - architectural and building plans
 - council plans
 - developer plans
- other documents, including:
 - applications
 - forms

RANGE STATEMENT

- other reports as available.
- *Performance requirements* include:
 - steam generation and consumption, and steam and pressure quality, established using Australian and New Zealand standards and manufacturers' information.
- *Layout of pipework systems:*
 - should not unduly affect building integrity and aesthetic appeal
 - have principles of economy, serviceability, durability and fit for use applied.
- *Fittings and valves* include:
 - bends
 - couplings
 - isolating valves
 - pressure relief valves
 - steam headers
 - steam traps
 - tees
 - unions.
- *Pipe size calculations* include:
 - energy
 - pressure
 - sizing
 - storage
 - volume.
- *Steam appliances:*
 - include:
 - calorifiers
 - industrial applications
 - kitchen and laundry appliances
 - sterilisers
 - water heaters
 - details should include:
 - components
 - construction
 - electronic controls
 - methods of temperature and pressure control.
- *Boilers:*
 - include:
 - coal
 - electric
 - fire tube
 - gas

RANGE STATEMENT

- oil
- packaged
- solid fuel
- water tube
- factors to be considered when selecting a boiler:
 - advantages and disadvantages of boiler types
 - capacity and size
 - designs based on anticipated use
 - energy sources
 - methods of reducing heat losses
 - pressure controls and components
 - storage requirement calculations
 - suitable time period between refilling
 - valves.

Steam circuits include:

- condensate return
- feed pumps
- feed tanks
- headers
- steam distribution
- water treatment.

Steam trap types and their operation:

- types include:
 - mechanical
 - thermodynamic
 - thermostatic
 - other applicable types
- operation includes:
 - installation
 - location.

Steam injection includes:

- noise control
- open ended pipe
- proprietary
- sparge pipe.

Insulation:

- includes:
 - felt
 - fibreglass
 - rock wool

RANGE STATEMENT

- insulation protection, includes:
 - plastic
 - sheet metal.
- Pipe fixings*** include:
 - anchors
 - bracket spacing
 - corrosion protection
 - hanging brackets
 - material requirements
 - saddles
 - wall and ceiling brackets.
- Materials*** include:
 - copper
 - steel
 - other approved materials.
- Joining methods*** include:
 - brazing
 - mechanical joints
 - threading.
- Installation requirements*** include:
 - clipping
 - installation details
 - jointing requirements
 - level of workmanship.
- Designed*** includes:
 - cost relating to performance, including:
 - milestones
 - standard procedures
 - standards of work
 - work schedules
 - prescriptive designs, including detail relating to:
 - materials and quality of work
 - nominated subcontractors
 - provision of on-site facilities and site access
 - quality assurance.
- Plans*** may include:
 - axonometrics
 - cross-sections
 - details
 - elevations
 - isometrics
 - schematics, which may be produced using:
 - computer generation.

RANGE STATEMENT

- Specification** includes:
- Indian ink
 - pencil
 - pigment liner
 - sections.
 - appliances
 - clipping
 - details of specialised components
 - jointing
 - manufacturer requirements
 - materials
 - valves
 - workmanship.
- Testing** includes:
- flow testing
 - inspection checklist
 - leak testing
 - pressure testing
 - quality assurance (QA) audit.
- Commissioning schedule** includes:
- checking for burrs and obstructions
 - commissioning appliances
 - confirming fit for purpose
 - purging system
 - removing contaminants.
- Operation and maintenance manual** includes:
- check for blockages
 - leak detection
 - regular inspection
 - regular maintenance requirements.

Unit Sector(s)

Unit sector Plumbing and services

Co-requisite units

Co-requisite units Nil

Co-requisite units Nil

Functional area

Functional area