



**Australian Government**

# **CPCPMS4023A Design compressed air systems**

**Release 1**

## **CPCPMS4023A Design compressed air systems**

### **Modification History**

Changes to performance criteria, required skills and knowledge, range statement and critical aspects

Not equivalent to CPCPMS4003A

### **Unit Descriptor**

This unit of competency specifies the outcomes required to design and size compressed air distribution systems and prepare system plans and specifications.

### **Application of the Unit**

This unit of competency supports the needs of experienced plumbers with responsibility for providing consultancy or supervision in the evaluation and design of compressed air systems.

### **Licensing/Regulatory Information**

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

### **Pre-Requisites**

Nil

### **Employability Skills Information**

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 required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.

## Elements and Performance Criteria

- |   |                                    |     |                                                                                                                                                                   |
|---|------------------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Evaluate design parameters.        | 1.1 | Scope of work for the design of compressed air systems is established.                                                                                            |
|   |                                    | 1.2 | <b>Client requirements</b> are determined from plans, specifications and client brief.                                                                            |
|   |                                    | 1.3 | <b>Cost-benefit analysis</b> is conducted comparing a range of materials and system designs.                                                                      |
|   |                                    | 1.4 | <b>Statutory, regulatory and Australian and New Zealand Standard requirements</b> for the design of compressed air systems are interpreted, analysed and applied. |
|   |                                    | 1.5 | <b>Manufacturer requirements</b> and trade and technical manuals are interpreted.                                                                                 |
|   |                                    | 1.6 | Additional research, including a <b>desktop study</b> , is conducted to outline design parameters.                                                                |
|   |                                    | 1.7 | <b>Performance requirements</b> are established.                                                                                                                  |
| 2 | Plan and detail system components. | 2.1 | <b>Layout of pipework systems</b> and type and location of <b>fittings and valves</b> are planned.                                                                |
|   |                                    | 2.2 | <b>System calculations</b> are conducted for a range of applications.                                                                                             |
|   |                                    | 2.3 | Compressed air system <b>equipment and components</b> are sized and specified.                                                                                    |
|   |                                    | 2.4 | Noise reduction methods are analysed and suitable methods specified.                                                                                              |
|   |                                    | 2.5 | Approved <b>materials</b> and <b>jointing methods</b> and <b>installation requirements</b> are specified.                                                         |
| 3 | Design and size systems.           | 3.1 | Compressed air systems are designed for a range of applications.                                                                                                  |
|   |                                    | 3.2 | Compressed air systems are designed and sized using computer software packages.                                                                                   |
|   |                                    | 3.3 | <b>Sustainability principles and concepts</b> are applied                                                                                                         |

throughout the design process.

- |   |                       |     |                                                                             |
|---|-----------------------|-----|-----------------------------------------------------------------------------|
| 4 | Prepare documentation | 4.1 | <b><i>Plans</i></b> are prepared for a range of compressed air systems.     |
|   |                       | 4.2 | <b><i>Specification</i></b> for a compressed air system is prepared.        |
|   |                       | 4.3 | <b><i>Testing</i></b> and <b><i>commissioning schedule</i></b> is prepared. |
|   |                       | 4.4 | <b><i>Operation and maintenance manual</i></b> is produced.                 |

## Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

### Required skills

- communication skills to:
  - confirm job specifications and client requirements
  - enable clear and direct communication, using questioning to identify and confirm requirements, share information, listen and understand
  - report faults with application
  - use language and concepts appropriate to cultural differences
  - use and interpret non-verbal communication
- literacy skills to:
  - read and interpret:
    - codes, legislation and standards
    - documentation from a variety of sources
    - plans and specifications
    - regulatory authorities' requirements
- numeracy skills to apply measurements and calculations
- planning and organising skills to plan for and set out work

### Required knowledge

- nature of materials and effect of their performance in a variety of conditions
- WHS and organisational quality procedures and processes
- principles of technology in the design of compressed air systems
- terminology, definitions, installation methods, applications and hazards identified in relation to compressed air devices and systems used according to Australian and New Zealand standards and other standards, codes or standard operating procedures
- work drawings and specifications
- workplace safety requirements, including relevant statutory regulations, codes and standards

## 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, provided that simulated or project-based assessment techniques fully replicate construction 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 the ability to:

- apply sustainability principles and concepts associated with the design
- identify electrical hazards associated with the design
- evaluate and document design parameters including client, regulatory, manufacturer and Australian and New Zealand standard requirements for a range of compressed air systems
- produce appropriate layouts for compressed air systems according to manufacturers' and regulatory requirements
- calculate pipe sizes according to regulations and manufacturers' requirements
- design and size a compressed air system using appropriate software
- prepare plans for a range of compressed air systems to industry standards
- prepare a specification for a compressed air system
- prepare a testing and commissioning schedule
- prepare an operation and maintenance manual.

### 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 work 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
- 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

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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.

***Client requirements*** may include:

- architectural specifications
- builders' specifications
- owner requirements
- specialist use applications.

***Cost-benefit analysis:***

- compares the range of suitable treatment and disposal options, materials, system choices, disinfection options, water savings and environmental benefits compared to initial and ongoing maintenance costs.

***Statutory, regulatory and Australian and New Zealand standard requirements*** include:

- Acts
- Australian and New Zealand standard requirements
- industry standards
- local and state government policies, including group and strata titling
- National Construction Code
- regulations.

**Manufacturer requirements** may include:

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

**Desktop study** may include collection and interpretation of existing data for design purposes in:

- architectural and building plans and other documents, including:
  - applications
  - brochures
  - forms
  - policies
  - reports
- council plans
- developer plans
- manufacturer data.

**Performance requirements** may include:

- Australian and New Zealand standards
- local authority plans
- operational pressures and compressed air consumption
- pressure and air quality.

**Layout of pipework systems** may include:

- building integrity and aesthetic appeal should not be unduly effected by pipework
- principles of economy, serviceability, durability and fit for use should be applied.

**Fittings and valves** may include:

- bends
- couplings
- isolating valves
- pressure relief valves
- tees
- unions.

**System calculations** may include:

- air consumption
- compressed air volume and storage
- distribution pressures
- energy

- interpretation of design charts and tables
- pipe sizing.

***Equipment and components*** may include:

- air filtering equipment, including proprietary filtering systems and air scrubbing systems
- capacity and size
- compressed air appliances, including air-operated tools, machinery and equipment
- moisture removal methods
- mounting and installation requirements
- oiling equipment
- reciprocating compressors
- single and multi-stage compressors
- valves, pressure controls and components.

***Materials*** may include:

- approved pressure-rated materials
- copper
- steel.

***Jointing methods*** may include:

- brazing
- mechanical joints
- threading.

***Installation requirements*** may include:

- clipping
- installation details
- jointing requirements
- level of workmanship.

***Sustainability principles and concepts:***

- cover the current and future social, economic and environmental use of resources
- may include:
  - using efficient design principles throughout
  - incorporating efficient use of material in the design
  - design that ensures minimal environmental impact
  - choice of appropriate components and equipment.

**Plans:**

- may include:
  - axonometrics
  - cross-sections
  - details
  - elevations
  - isometrics
  - schematics
  - sections
- may be produced using:
  - computer generation
  - Indian ink
  - pencil
  - pigment liner.

**Specification** may include:

- appliances
- clipping
- detailing of specialised components
- jointing
- manufacturer requirements
- materials
- valves
- workmanship.

**Testing** may include:

- flow testing
- inspection checklist
- leak testing
- pressure testing
- quality assurance (QA) audit.

**Commissioning schedule** may include:

- check fit for purpose
- check for burrs and obstructions
- commission appliances
- purge system
- remove contaminants.

**Operation and maintenance manual** may include:

- check for blockages
- leak detection
- regular inspections
- regular maintenance requirements.

## **Unit Sector(s)**

### **Functional area**

**Unit sector** Plumbing and services

## **Custom Content Section**

Not applicable.