



**Australian Government**

# **CPCPFS5011A Design fire sprinkler systems**

**Release 1**

## **CPCPFS5011A Design fire sprinkler systems**

### **Modification History**

Changes to performance criteria, required skills, range statement and critical aspects  
Not equivalent to CPCPFS5001A

### **Unit Descriptor**

This unit of competency specifies the outcomes required to design and size fire sprinkler systems and to detail and specify the layout, materials, components, water storage requirements, and flow and pressure requirements for fire sprinkler systems in buildings.

### **Application of the Unit**

This unit of competency supports the needs of experienced tradespeople responsible for designing fire sprinkler systems.

Site location for work application may be for new projects or an existing structure being renovated, extended, restored or maintained.

### **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 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

- |   |                             |     |   |
|---|-----------------------------|-----|---|
| 1 | Evaluate design parameters. | 1.1 | <i>Scope of work</i> is established for design of fire sprinkler systems for wide span and high-rise building projects.   |
|   |                             | 1.2 | <i>Design requirements</i> are determined from plans, specifications and client brief.  |
|   |                             | 1.3 | <i>Cost-benefit analysis</i> is conducted comparing a range of pipe materials and system designs.   |
|   |                             | 1.4 | <i>Fire department, statutory, regulatory, Australian and New Zealand standards and relevant building code requirements</i> for the design of fire sprinkler systems are interpreted and applied. |
|   |                             | 1.5 | <i>Manufacturer requirements</i> and trade and technical manuals are interpreted and applied.   |
|   |                             | 1.6 | Flow and pressure requirements are established, <i>flow and pressure tests</i> are conducted and council main flows and pressures are established.  |
|   |                             | 1.7 | Additional research, including a <i>desktop study</i> , is conducted and <i>performance requirements</i> are established.   |

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|---|------------------------------------|-----|--|
| 2 | Plan and detail system components. | 2.1 | <b><i>Layout of pipework systems</i></b> and type and location of <b><i>fittings and valves</i></b> are planned.                                   |
|   |                                    | 2.2 | Type, location and requirements for <b><i>backflow prevention devices</i></b> and <b><i>alarm and valve assemblies</i></b> are detailed.           |
|   |                                    | 2.3 | Pipe sizes, velocities, flows and pressures are <b><i>calculated</i></b> for a range of applications.  |
|   |                                    | 2.4 | Approved <b><i>materials, jointing methods</i></b> and sprinkler heads for fire sprinkler systems are specified.                                   |
|   |                                    | 2.5 | Smoke alarm systems, <b><i>booster assemblies</i></b> , booster relay and jacking pumps are designed and detailed.                                 |
|   |                                    | 2.6 | <b><i>Pipe fixings</i></b> are designed for a range of applications.   |
|   |                                    | 2.7 | <b><i>Water storage systems</i></b> and <b><i>pump, pump controls and pumproom requirements</i></b> are sized and detailed.                        |
|   |                                    | 2.8 | <b><i>Test points and associated drainage systems</i></b> are designed and sized.  |
|   |                                    | 2.9 | <b><i>Installation requirements</i></b> are specified.   |
| 3 | Design and size systems.           | 3.1 | Fire sprinkler systems are designed for a range of wide span and high-rise building applications.  |
|   |                                    | 3.2 | Combined water supply, fire hydrant and hose reel and sprinkler systems are designed for a range of wide span and high-rise building applications. |
|   |                                    | 3.3 | Sprinkler systems for Grades 1, 2 and 3 water supplies are designed.   |
|   |                                    | 3.4 | Range of <b><i>sprinkler system configurations</i></b> is designed.  |
|   |                                    | 3.5 | Fire sprinkler systems are designed and sized using computer software packages.  |
|   |                                    | 3.6 | <b><i>Sustainability principles and concepts</i></b> are observed when preparing for and undertaking work process.                                 |

- 4 Prepare documentation.
  - 4.1 **Plans** are prepared and detailed for a range of fire sprinkler systems.
  - 4.2 **Specification** for a fire sprinkler system is prepared.
  - 4.3 **Testing** and **commissioning schedule** is prepared.
  - 4.4 **Operation and maintenance manual** is produced.

## Required Skills and Knowledge

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

### Required skills

- communication skills to:
  - access information
  - determine requirements
  - enable clear and direct communication, using questioning to identify and confirm requirements, share information, listen and understand
  - follow and give instructions
  - use language and concepts appropriate to cultural differences
  - use and interpret non-verbal communication, such as hand signals
- initiative and enterprise skills to:
  - develop creative and responsive approaches
  - identify and accurately report to appropriate personnel any faults in tools, equipment or materials
- literacy skills to:
  - read and interpret plans, specifications and documentation from a variety of sources, including:
    - Australian standards
    - National Construction Code
    - WHS and environmental requirements
    - plumbing regulations
  - prepare written documentation, including:
    - operation and maintenance manual
    - plans, specifications and reports
- numeracy skills to:
  - apply measurements and calculations
  - interpret data
- planning and organising skills to:
  - plan and sequence tasks with others
  - research, collect, organise and understand information relating to the design of fire sprinkler systems
  - take initiative and make decisions
- problem-solving skills to analyse requirements, carry out tests, 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 abilities
- technical skills to:
    - apply design principles relating to hydraulic systems
    - use tools and equipment, including drawing instruments, measuring equipment and computer-aided design (CAD) software
  - technology skills to:
    - access and understand site-specific instructions in a variety of media
    - use mobile communication technology

### **Required knowledge**

- requirements of state regulatory authorities, Australian standards and manufacturer specifications, including:
  - AS/NZS2118 Automatic fire sprinkler systems – general requirements
  - AS/NZS3500 National plumbing and drainage
  - AS2200 Design charts for water supply and sewerage
  - environmental requirements
  - hazards associated with devices and systems used in the hydraulic sector
  - installation methods used in hydraulic systems
  - other standards, codes or standard operating procedures
  - terminology and definitions used in hydraulic design
- quality assurance requirements, including:
  - Environment Protection Authority
  - internal company quality assurance policy and risk management strategy
  - International Standards Organisation
  - nature of materials used and effects of performance under various conditions
  - site safety plan
  - workplace operations and procedures
- variety of applications of technology principles in design of fire sprinkler, hydrant and hose reel systems for all classes of building
- 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 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 preparing designs and associated documentation for fire sprinkler systems for two different categories of wide span and high-rise buildings.

### 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, fire authority, regulatory, manufacturer, NCC and Australian and New Zealand standard requirements for a range of fire sprinkler systems
- planning and detailing system components, including:
  - applying sustainability principles and concepts
  - alarm and valve assemblies
  - preparing a specification for a fire sprinkler system
  - preparing a testing and commissioning schedule
  - preparing an operation and maintenance manual
  - preparing plans for a range of fire sprinkler systems
  - sprinkler heads
  - water storage systems.

### 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.

***Scope of work*** includes:

- interpretation of plans and specifications
- sizing and documenting layout of fire sprinkler systems for applications, including residential, commercial and industrial.

***Design requirements*** may include:

- architectural specifications
- builder specifications
- owner requirements
- relevant statutory authorities
- specialist design 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 project

integrity.

***Fire department, statutory, regulatory, Australian and New Zealand standards and relevant building code requirements*** may include:

- relevant Acts, regulations and local and state government policies
- AS/NZS2118 Automatic fire sprinkler systems - general requirements
- AS2419 Fire hydrant installations – system design, installation and commission
- material and authorisation standards specified by:
  - National Construction Code (NCC)
  - statutory authorities.

***Manufacturer requirements*** may include:

- material specifications and standards
- pump tables
- sizing tables
- sprinkler heads and components
- technical and trade manuals.

***Flow and pressure tests*** may include:

- results of flow and pressure tests conducted by a contractor
- on-site measurement of flow (l/s) and pressure (kPa).

***Desktop study*** may include:

- collection and interpretation of existing data for design purposes from:
  - architectural and building plans
  - council requirements
  - developer requirements
  - regulatory requirements
  - environmental, social and economic considerations
- other documents and reports as appropriate.

***Performance requirements*** may include:

- flow, velocity, pressure and discharge requirements, established using Australian and New Zealand standards and local statutory authorities' plans.

***Layout of pipework systems:***

- may include:
  - appropriate water supply

- grid systems
- ring main
- tree system
- should have principles of economy, serviceability, durability and fit for use applied.

***Fittings and valves*** may include:

- fittings:
  - mechanical fittings
  - bends
  - elbows
  - tees
  - unions
- valves:
  - backflow prevention
  - pressure relief
  - isolating
  - pressure limiting
  - pressure reduction
  - strainers
  - water-saving devices.

***Backflow prevention devices:***

- may be testable or non-testable devices and installed as:
  - individual protection
  - zone protection
  - containment protection.

***Alarm and valve assemblies*** may include:

- wet
- dry
- deluge
- pre-action
- mechanical and electrical alarms
- ancillaries and trims.

***Calculations*** may include:

- hazard classification
- hydraulic
- pressure and flow
- density of discharge
- velocity

- volume
- friction
- area of operation (including shapes).

**Materials** may include:

- chlorinated polyvinyl chloride (CPVC)
- copper
- steel
- fittings and fixtures
- other approved materials.

**Joining methods** may include:

- silver braze
- welded
- solvent welded
- flanged
- mechanical joints
- threaded
- other approved methods of joining.

**Booster assemblies** may include:

- cabinet and block plans
- non-return and isolating valves
- fire appliance (hard stand) access
- pressure gauges
- appropriate booster assembly.

**Pipe fixings** may include fire and load rated:

- masonry fixing
- vertical support fixing
- pipe supports spacings and locations
- bedding and thrust blocks
- corrosion protection
- cover
- material requirements.

**Water storage systems** may include:

- automatic controls
- inlet valve design and sizing
- outlet valve design and sizing
- overflow requirements
- safe tray requirements
- tank sizes
- vortex plates

- tank siting.

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

- manual and/or automatic controls
- inlet and outlet design requirements
- installation and mounting requirements
- pump selection
- space requirements
- electrical supply requirements
- valve requirements
- ventilation requirements
- heating
- exhaust extraction.

***Test points and associated drainage systems*** may include:

- design and sizing of collection points and tundishes to prevent spillage, overflow and damage to building finishes
- design and sizing of drainage systems to cater for maximum flow conditions
- specification of materials for systems, including copper, polyvinyl chloride (PVC) and galvanised piping
- other approved materials.

***Installation requirements*** may include:

- corrosion and elements protection
- installation details
- jointing requirements
- supports
- workmanship and quality control.

***Sprinkler system configurations*** may include:

- deluge
- drencher
- dry
- pre-action
- special hazard
- wet.

***Sustainability principles and concepts:***

- cover the current and future social, economic and environmental use of resources
- may include:
  - selecting appropriate material to ensure minimal

environmental impact

- efficient use of material
- efficient energy usage
- efficient use and recycling of material
- disposing of waste material to ensure minimal environmental impact
- efficient water usage, harvesting and/or disposal
- life cycle cost-benefit analysis
- consideration of the Green Building Council of Australia rating scheme.

**Plans** may include:

- axonometrics
- cross-sections
- details
- elevations
- isometrics
- schematics, which may be produced using:
  - computer generation
  - drawing equipment
- sections
- submission for client approval
- pipework fabrication sheets and stores lists
- service coordination.

**Specification** may include:

- support and specialised components
- jointing
- manufacturer
- materials
- valve selection
- quality control/workmanship.

**Testing** may include:

- air pressure test
- hydrostatic test
- flush system
- quality assurance (QA) audit.

**Commissioning schedule** may include:

- direct inspection
- flow test
- system operation.

- Operation and maintenance manual*** may include:
- hydraulic calculations and water supply details
  - as installed drawings
  - relevant standards of maintenance of all maintainable equipment
  - manufacturer data
  - system description and operating instructions
  - certificate reference.

## **Unit Sector(s)**

### **Functional area**

**Unit sector** Plumbing and services

## **Custom Content Section**

Not applicable.