

# Unit of Competency CPCPFS5011

## Design fire sprinkler systems

### Application

This unit specifies the skills and knowledge required to design and size fire sprinkler systems and prepare operational and compliance documentation.

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

This unit's requirements are typically carried out by experienced hydraulic design consultants or fire systems designers on a new or existing domestic or residential structure.

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"><li>1.1 Establish scope of work for design of fire sprinkler systems for wide span and high-rise building projects.</li><li>1.2 Determine design requirements from plans, specifications and client brief.</li><li>1.3 Interpret and apply fire department, statutory, regulatory, Australian and New Zealand standards and relevant building code requirements.</li><li>1.4 Interpret trade and technical manuals and manufacturer requirements and apply to design.</li><li>1.5 Apply sustainability principles and concepts as part of the design process.</li><li>1.6 Establish flow and pressure requirements.</li><li>1.7 Conduct flow and pressure tests and establish council main flows and pressures.</li><li>1.8 Conduct research including a desktop study and establish performance requirements.</li><li>1.9 Conduct a cost-benefit analysis to compare a range of pipe materials and system designs.</li></ul>
2. Plan and detail system components.	<ul style="list-style-type: none"><li>2.1 Plan layout of pipework systems including type and location of fittings and valves.</li><li>2.2 Detail type, location and requirements for backflow prevention devices and alarm and valve assemblies.</li><li>2.3 Calculate pipe sizes, velocities, flows and pressures for a range of applications.</li><li>2.4 Specify approved materials, jointing methods and sprinkler heads for fire sprinkler systems.</li><li>2.5 Plan and detail smoke alarm systems, booster assemblies, booster relay and jacking pumps.</li><li>2.6 Plan pipe fixings for a range of applications.</li><li>2.7 Plan and size water storage systems and pump, pump controls and pump room requirements.</li><li>2.8 Plan and size test points and associated drainage systems.</li><li>2.9 Specify installation requirements.</li></ul>

3.Design and size systems.	3.1 Design fire sprinkler systems for a range of wide span and high-rise building applications. 3.2 Design combined water supply, fire hydrant and hose reel and sprinkler systems for a range of wide span and high-rise building applications. 3.3 Design sprinkler systems for water supplies Grades 1, 2 and 3. 3.4 Design a range of sprinkler system configurations. 3.5 Design and size fire sprinkler systems using computer software packages.
4. Prepare documentation.	4.1 Prepare and detail plans for a range of fire sprinkler systems. 4.2 Prepare specification for a fire sprinkler system. 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 CPCPF55011A Design fire sprinkler systems.

## Links

Companion Volume Implementation Guide:

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

# Assessment Requirements for CPCPFS5011 Design fire sprinkler systems

## Performance Evidence

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

- sizing and designing two different categories of fire sprinkler systems for high-rise buildings, including:
  - o plan and detail all system component
  - o meet the performance criteria for this unit.

## Knowledge Evidence

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

- requirements of state regulatory authorities, Australian standards and manufacturer specifications:
  - o AS/NZS 2118.1 Automatic fire sprinkler systems - General systems
  - o AS/NZS 3500 Plumbing and drainage set
  - o AS 2200 Design charts for water supply and sewerage
  - o AS 2419 Fire hydrant installations - system design, installation and commissioning
  - o material and authorisation standards specified by:
    - National Construction Code (NCC)
    - statutory authorities
  - o environmental requirements
  - o hazards associated with devices and systems used in the hydraulic sector
  - o installation methods used in hydraulic systems
  - o other standards, codes or standard operating procedures
- terminology and definitions used in hydraulic design
- quality assurance requirements:
  - o Environment Protection Authority (EPA)
  - o internal company quality assurance policy and risk management strategy
  - o International Standards Organisation (ISO)
  - o nature of materials used and effects of performance under various conditions
  - o site safety plan
  - o 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
- scope of work:
  - o interpretation of plans and specifications

- o sizing and documenting layout of fire sprinkler systems for applications, including residential, commercial and industrial
- design requirements:
  - o architectural specifications
  - o builder specifications
  - o owner requirements
  - o relevant statutory authorities
  - o specialist design applications
- cost-benefit analysis including comparison of range of suitable materials and system choices available to enable cost-effective choices to be made without compromising project integrity
- manufacturer requirements:
  - o material specifications and standards
  - o pump tables
  - o sizing tables
  - o sprinkler heads and components
  - o technical and trade manuals
- flow and pressure tests such as:
  - o results of flow and pressure tests conducted by a contractor
  - o on-site measurement of flow (l/s) and pressure (kPa)
- desktop study to collect and interpret existing data for design purposes from:
  - o architectural and building plans
  - o council requirements
  - o developer requirements
  - o regulatory requirements
  - o environmental, social and economic considerations
  - o other documents and reports as appropriate
- performance requirements including flow, velocity, pressure and discharge requirements, established using Australian and New Zealand standards and local statutory authorities' plans
- layout of pipework systems:
  - o appropriate water supply
  - o grid systems
  - o ring main
  - o tree system
  - o should have principles of economy, serviceability, durability and fit for use applied
- types of fittings:
  - o mechanical fittings
  - o bends
  - o elbows
  - o tees
  - o unions
- types of valves:
  - o backflow prevention
  - o pressure relief

- o isolating
  - o pressure limiting
  - o pressure reduction
  - o strainers
  - o water-saving devices
- backflow prevention devices, which may be testable or non-testable devices and installed as:
  - o individual protection
  - o zone protection
  - o containment protection
- types of alarm and valve assemblies:
  - o wet
  - o dry
  - o deluge
  - o pre-action
  - o mechanical and electrical alarms
  - o ancillaries and trims
- calculations used to identify:
  - o hazard classification
  - o hydraulic
  - o pressure and flow
  - o density of discharge
  - o velocity
  - o volume
  - o friction
  - o area of operation (including shapes)
- materials used:
  - o chlorinated polyvinyl chloride (CPVC)
  - o copper
  - o steel
  - o fittings and fixtures
  - o other approved materials
- jointing methods:
  - o silver braze
  - o welded
  - o solvent welded
  - o flanged
  - o mechanical joints
  - o threaded
  - o other approved methods of jointing
- booster assemblies:
  - o cabinet and block plans
  - o non-return and isolating valves
  - o fire appliance (hard stand) access

- pressure gauges
  - appropriate booster assembly
- fire and load rated pipe fixings:
  - masonry fixing
  - vertical support fixing
  - pipe supports spacings and locations
  - bedding and thrust blocks
  - corrosion protection
  - cover
  - material requirements
- water storage systems considerations:
  - 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 pump room requirements:
  - 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:
  - 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:
  - corrosion and elements protection
  - installation details
  - jointing requirements
  - supports
  - workmanship and quality control

- sprinkler system configurations:
  - deluge
  - drencher
  - dry
  - pre-action
  - special hazard
  - wet
- methods to apply sustainability principles and concepts:
  - 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
- plan inclusions:
  - axonometrics
  - cross-sections
  - details
  - elevations
  - isometrics
  - sections
  - submission for client approval
  - pipework fabrication sheets and stores lists
  - service coordination
- schematics produced using:
  - computer generation
  - drawing equipment
- specification inclusions:
  - support and specialised components
  - jointing
  - manufacturer
  - materials
  - valve selection
  - quality control/workmanship
- types of testing:
  - air pressure test
  - hydrostatic test
  - flush system
  - quality assurance (QA) audit
- commissioning schedule inclusions:
  - direct inspection

- o flow test
  - o system operation
- operation and maintenance manual inclusions:
  - o hydraulic calculations and water supply details
  - o as installed drawings
  - o relevant standards of maintenance of all maintainable equipment
  - o manufacturer data
  - o system description and operating instructions
  - o certificate reference.

## 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

Companion Volume Implementation Guide:

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