



Australian Government

Department of Education, Employment and Workplace Relations

CPCPFS5001A Design fire sprinkler systems

Release: 1

CPCPFS5001A Design fire sprinkler systems

Modification History

Not Applicable

Unit Descriptor

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.
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Application of the Unit

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.
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Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units	Nil
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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.	1.1. Scope of work is established for design of fire sprinkler systems for wide span and high-rise building projects. 1.2. Design requirements are determined from plans, specifications and client briefs. 1.3. Cost-benefit analysis is conducted comparing a range of pipe materials and system designs. 1.4. Fire department, statutory, regulatory, Australian and New Zealand standards and relevant building code requirements for the design of fire sprinkler systems are interpreted and applied. 1.5. Manufacturer requirements and trade and technical manuals are interpreted and applied. 1.6. Flow and pressure requirements are established, flow and pressure tests are conducted and council main flows and pressures are established. 1.7. Additional research, including a desktop study, is conducted and performance requirements are established.
2. Plan and detail system components.	2.1. Layout of pipework systems and type and location of fittings and valves are planned. 2.2. Type, location and requirements for backflow prevention devices and alarm and valve assemblies are detailed. 2.3. Pipe sizes, velocities, flows and pressures are calculated for a range of applications. 2.4. Approved materials, jointing methods and sprinkler heads for fire sprinkler systems are specified. 2.5. Smoke alarm systems, booster assemblies, booster relay and jacking pumps are designed and detailed. 2.6. Pipe fixings are designed for a range of applications. 2.7. Water storage systems and pump, pump controls and pumphouse requirements are sized and detailed. 2.8. Test points and associated drainage systems are designed and sized. 2.9. Installation requirements are specified, including exit signage.
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

ELEMENT	PERFORMANCE CRITERIA
	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 sprinkler system configurations is designed.
	3.5. Fire sprinkler systems are designed and sized using computer software packages.
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

REQUIRED SKILLS AND KNOWLEDGE

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

Required skills

Required skills for this unit are:

- applying design principles relating to hydraulic systems
- 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
 - plan and sequence tasks with others
 - read and interpret drawings, specifications and documentation from a variety of sources, including:
 - Australian standards
 - building codes
 - OHS and environmental requirements
 - plumbing regulations
 - use language and concepts appropriate to cultural differences
 - use and interpret non-verbal communication, such as hand signals

REQUIRED SKILLS AND KNOWLEDGE

- written skills to prepare documentation, including:
 - operation and maintenance manual
 - plans, specifications and reports
- identifying and accurately reporting to appropriate personnel any faults in tools, equipment or materials
- innovation skills to develop creative and responsive approaches
- numeracy skills to:
 - apply measurements and calculations
 - interpret data
- planning and organisational skills to:
 - 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
- technological skills to:
 - access and understand site-specific instructions in a variety of media
 - use mobile communication technology
- using tools and equipment, including drawing instruments, measuring equipment and computer-aided design (CAD) software.

Required knowledge

Required knowledge for this unit is:

- 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 set
 - 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

REQUIRED SKILLS AND KNOWLEDGE

- 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

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.

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, BCA and Australian and New Zealand standard requirements for a range of fire sprinkler systems
- planning and detailing system components, including:
 - 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

EVIDENCE GUIDE

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 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

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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

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

Design requirements include:

- architectural specifications
- builder specifications

RANGE STATEMENT

	- owner requirements - specialist design applications.
<i>Cost-benefit analysis</i> includes:	comparison of range of suitable materials and system choices available to enable cost-effective choices to be made without compromising project integrity.
<i>Fire department, statutory, regulatory, Australian and New Zealand standards and relevant building code requirements</i> include:	- relevant Acts, regulations and local and state government policies - AS2200 Design charts for water supply and sewerage - AS/NZS2118 Automatic fire sprinkler systems - general requirements - AS2419 Fire hydrant installations - system design, installation and commission - material and authorisation standards specified by: - Building Code of Australia (BCA) - local authority - statutory plumbing authority.
<i>Manufacturer requirements</i> include:	- material specifications - pump tables - sizing tables - technical and trade manuals.
<i>Flow and pressure tests</i> include:	- interpretation of flow and pressure tests conducted by a contractor - on-site measurement of flow (l and s), velocity (m and s) and pressure (kPa).
<i>Desktop study</i> includes collection and interpretation of existing data for design purposes from:	- architectural and building plans - council requirements - developer requirements - regulatory requirements - other documents and reports as available.
<i>Performance requirements</i> include:	flow, velocity, pressure and discharge requirements, established using Australian and New Zealand standards and local authority plans.
<i>Layout of pipework systems:</i>	- covers: - dual feed - range systems - ring main - single pipe

RANGE STATEMENT

Fittings and valves:

- should have principles of economy, serviceability, durability and fit for use applied
- should not unduly affect building integrity and aesthetic appeal.
- fittings:
 - bends
 - elbows
 - tees
 - unions
- valves:
 - backflow prevention
 - excessive pressure
 - isolating
 - pressure limiting
 - pressure reduction
 - strainers.

Backflow prevention devices include:

- break tanks
- individual protection
- property protection
- testable and non-testable devices
- zone protection.

Alarm and valve assemblies include:

- clapper valves
- excess flow valves
- manual and electrical alarms.

Calculations include:

- pressure
- rate of discharge
- temperature
- velocity
- volume.

Materials include:

- acrylonitrile butadiene styrene (ABS)
- composite pipework
- copper
- cross-linked polyethylene
- fittings and fixtures
- polybutylene
- protective coatings
- steel.

Jointing methods include:

- brazing
- compression

RANGE STATEMENT

	• flaring • mechanical joints • rubber ring joints • screwing • soldering.
Booster assemblies include:	• cabinet and block plans • check and isolating valves • fire appliance access • pressure gauges • single and double types.
Pipe fixings include:	• anchors • bedding • bracket spacing • corrosion protection • cover • hanging brackets • material requirements • saddles • wall and ceiling brackets.
Water storage systems include:	• automatic controls • inlet valve design and sizing • outlet sizing • overflow requirements • safe tray requirements • tank sizes • vortex plates.
Pump, pump controls and pumphoom requirements include:	• automatic controls • impeller sizing • inlet and outlet design requirements • installation and mounting requirements • pump selection • pump sizing • space requirements • valve requirements.
Test points and associated drainage systems 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,

RANGE STATEMENT

	including copper, polyvinyl chloride (PVC), galvanised piping and other materials.
Installation requirements include:	• clipping • installation details • insulation • jointing requirements • level of workmanship.
Sprinkler system configurations include:	• deluge systems • layout and distribution of range pipes • obstacle avoidance • room shape and height configurations • sprinkler head placement • wall and ceiling wetting systems • wet pipe and dry pipe systems.
Plans cover:	• axonometrics • cross-sections • details • elevations • isometrics • schematics, which may be produced using: • pencil • Indian ink • pigment liner • computer generation • sections.
Specification may include:	• clipping and specialised components • jointing • manufacturer • materials • valve selection • workmanship.
Testing includes:	• air pressure test • defect inspection • hydrostatic test • mains pressure test • quality assurance (QA) audit.
Commissioning schedule includes:	• flow test • leak check • pressure test

RANGE STATEMENT

Operation and maintenance manual may include:

- system purge
- valve operation.
- leak detection
- pump maintenance
- valve maintenance
- water auditing
- yearly inspection
- yearly maintenance requirements.

Unit Sector(s)

Unit sector Plumbing and services

Co-requisite units

Co-requisite units Nil

Functional area

Functional area