Australian Government

Department of Education, Employment and Workplace Relations

CPCSFS5009A Create detailed designs for fire systems' water supplies

Release: 1

CPCSFS5009A Create detailed designs for fire systems' water supplies

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit of competency specifies the outcomes required to obtain, process and set up drawings for the detailed design of water supplies for fire systems. The unit also involves assessing and selecting component requirements, setting out the locations of components and creating final notated drawings. Licensing, legislative, regulatory or certification requirements may apply to this unit and so the varying state or territory requirements should be confirmed with the relevant body.

Application of the Unit

Application of the unit	This unit of competency supports the role of fire systems' designers with responsibility for creating detailed designs for water supplies for fire systems. Fire systems designs are limited to those within the deemed-to-satisfy provisions of the Building Code of Australia or detailed fire systems designs for alternative solutions designed by fire engineers. This unit does not apply to fire systems for special hazard locations.

Licensing/Regulatory Information

Refer to Unit Descriptor

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. Confirm water-based fire systems designs.	1.1. Relevant ***project drawings and documentation*** are requested, received, named and filed according to workplace procedures. 1.2. A site visit is conducted if possible to confirm details and dimensions and to assess water supply installation risks and constraints. 1.3. The exact location of ***fire system components*** is notated on detailed design drawings according to relevant ***codes and standards***. 1.4. The detailed design drawings are named, filed and backed up according to workplace procedures.
2. Calculate pipe sizes and pump and tank requirements.	2.1. Hydraulic calculations are completed to assess correct pressure requirements for the effective operation of water-based fire systems. 2.2. Water flow and pressure test results are conducted and/or analysed to establish the minimum levels of available supply. 2.3. Shortfalls in pressure are determined and the sizes of pumps and tanks required are calculated. 2.4. Options for cost-effective and efficient solutions are considered with reference to manufacturer specifications for the performance of components and according to workplace policies.
3. Lay out the water supply design.	3.1. The most ***efficient and workable layout and location*** of ***water supply components*** are determined and notated on the drawings according to workplace procedures. 3.2. Dimensions are calculated, checked and notated on the drawings according to workplace procedures.
4. Submit drawings for approval and finalise design process.	4.1. Water supply design drawings are submitted to relevant personnel within the scheduled timeframe. 4.2. Required amendments to design drawings are made or ***negotiated*** as required. 4.3. Final approved design drawings are processed and distributed according to project and workplace requirements. 4.4. Fittings and components are selected and ordered according to project and workplace requirements.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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

Required skills

- accurate measuring
- accurate naming and filing of drawings, including:
  - formal document control
  - formal amendments, including:
  - history
  - transmittal notices
- editing and creating drawings, including:
  - layout
  - section
  - detail
  - external references
  - freezing layers
- operating computer software packages and systems, including:
  - word processing
  - spreadsheet
  - email
  - internet
  - proprietary project management software
  - proprietary hydraulic calculation software
  - parametric modelling of services coordination using proprietary software, such as Navis-Works or MEP-REVIT
- numeracy skills for:
  - calculating:
  - dimensions
  - pipe lengths
  - piping friction loss
  - tank size
  - pump capacity
  - motor output
  - performing fluid mechanic calculations
- language and literacy skills for:
  - listening to and communicating clearly with colleagues, installers, suppliers and contractors
  - participating in meetings, such as negotiations with fire engineering

REQUIRED SKILLS AND KNOWLEDGE
consultant, architect, builder or other service contractors • researching, accessing, reading, interpreting and applying current relevant legislation, codes and standards • letter writing, especially to formalise: • recognition of conflicts and errors on drawings supplied by other service contractors • agreements with other services • updating knowledge of products, software systems and technology • reading and interpreting drawings, plans and specifications, including: • fire systems design • mechanical • hydraulic • electrical • researching and evaluating competing technologies in new products and systems • developing constructive and cooperative working relationships with project team members, workplace colleagues, suppliers, installers and clients • negotiation and conflict management • organising own work, including creating personal systems and checklists for planning, managing and checking work • lateral thinking and problem solving • maintaining concentration, focus and attention to detail for long periods • managing detailed input to concurrent design projects at different stages of the process and with diverse sets of regulatory requirements
Required knowledge
• workplace design tools and processes • level of accuracy required in detailed design drawings • naming conventions for design drawings and drawing register • fire science, including: • fire behaviour and dynamics • impact of fire on structures and materials • products of combustion • fire control strategies • fire retardants • fire detection technologies • fire suppression technologies • fire containment • computer software functions and operation, including: • word processing

REQUIRED SKILLS AND KNOWLEDGE

- spreadsheet
- email
- internet
- proprietary project management software
- proprietary hydraulic calculation software

- relevant current legislation, codes and standards, including:
  - building Acts
  - building regulations
  - infrastructure supply regulations
  - the Building Code of Australia
  - Australian standards for fire systems
  - international standards for fire systems
  - other fire system standards commonly required by building insurers
- protection requirements for different buildings
- fire systems' technology and components, including:
  - water-based systems, including:
  - wet pipe sprinkler systems
  - deluge and drencher systems
  - dry pipe sprinkler systems
  - pre-action sprinkler systems
  - early suppression fast response (ESFR)
  - hydrants, hose reels and monitors
  - water supply tanks
  - fire pump sets
- fire system water supply technology and components, including:
  - electric pumps
  - diesel pumps
  - tanks
  - pressure vessels
  - booster configurations
- purpose and operation of fire systems, including:
  - layout
  - high hazard products
  - system operation
  - performance requirements
  - maintenance standards
  - system activation and operation
- characteristics and limitations of products and materials used in water supplies for

REQUIRED SKILLS AND KNOWLEDGE

fire systems and issues relating to material compatibility

- passive fire safety elements:
  - identification of passive elements
  - impact of fire systems design on passive elements
  - specifications required to safeguard integrity of passive fire element performance where penetrations are necessitated by the fire systems design
- basic principles of structural engineering
- characteristics of building materials
- construction industry terminology
- roles and responsibilities of relevant building project personnel, including:
  - architect
  - lead contractor
  - mechanical engineer
  - hydraulic engineer
  - electrical engineer
- on-site issues that can arise during the construction phase and impose changes to the designs of fire systems, fire systems' water supplies and other services
- installation methods, including:
  - access requirements
  - health and safety requirements
- water supplies, including:
  - common water sources
  - conservation requirements
  - in-ground reticulation
  - booster configurations
- fluid mechanics and hydraulics relating to:
  - water supply
  - pressure
  - pump selection
  - tank selection
  - pressure vessels
  - pipe range
- sustainability requirements and ratings, including:
  - energy conservation
  - water conservation
- pipe fabrication methods and constraints
- mathematic principles, equations and calculation methods, including:
  - financial calculations, for example to assess cost-effectiveness of water supply

REQUIRED SKILLS AND KNOWLEDGE
• trigonometry, for example to amend dimensions of pipe allowing for fittings • flow calculations, including: • area of operations • discharge rates and quantities • discharge times • pressure gain and loss • K-factors • pressure, temperature and volume relationship • Hazen-Williams equation • Darcy-Weisbach equation • computational fluid dynamics • basic principles of organic and inorganic chemistry • basic principles of physical sciences, including: • Boyle's Law • Charles' Law • Dalton's Law • Henry's Law • contractual processes

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, provided that the simulated or project-based assessment fully replicates workplace conditions, materials, activities, responsibilities and procedures. This unit could be assessed as an activity involving the effective performance and application of principles relating to the design of water supplies for fire systems for a range of different types of 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 the required skills and knowledge specified within this unit.
	
	In particular the person should demonstrate:
	• an understanding of fluid dynamics, hydraulics and the calculations required for the design of water supplies for fire systems
	• the ability to:
	  • read and interpret a range of design drawings
	  • create, manipulate, save, file and share design drawings
	  • identify, interpret and apply relevant current legislation, codes, standards and regulatory requirements impacting on the design of water supplies for fire systems
	  • interpret and apply fire engineer's designs for alternative solutions
	• the ability to produce fully compliant designs which meet requirements for water supplies for fire systems in a range of types of buildings, including:
	  • low-rise buildings

EVIDENCE GUIDE	
	• medium-rise buildings • high-rise buildings (over 25 metres) • buildings over 45 metres in height.
Context of and specific resources for assessment	Assessment of essential underpinning knowledge may be conducted in an off-site context. It is to comply with relevant regulatory or Australian standards' requirements. Resource implications for assessment include: • design briefs, drawings, plans and specifications • copies of codes, standards, legislation and regulatory requirements • access to information and communications technology - hardware and software • access to manufacturer's information regarding fittings and components.
Method of assessment	Assessment 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.
Guidance information for assessment	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. 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.

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.	
Project drawings and documentation may include:	• proposed water-based fire systems designs • mechanical • electrical • hydraulic.
Fire system components may include:	• discharge nozzles • pipework • system valves • zone valves • fire panels • hose reels • hydrant valves • booster valves.
Codes and standards may include:	• the Building Code of Australia • current relevant Australian standards for fire systems • current relevant international standards for fire systems • codes and standards stipulated by the building insurer.

Efficient and workable layout and location relate to:	• consideration of a range of sustainable options for producing the required water pressure for water-based fire systems
	• selection of cost-effective components and materials
	• consideration of:
	  • penetrations, especially through passive fire safety elements
	  • conflict with other services
	  • occupational health and safety risks
	  • access constraints

RANGE STATEMENT	
	• installation problems • aesthetic requirements • efficiencies to facilitate work on site and reduce labour costing.
Water supply components may include:	• electric pumps • diesel pumps • tanks • pressure vessels • booster configurations • components for water recovery systems.
Negotiations regarding amendments to design drawings may arise due to:	• non-compliance with applicable legislation, codes and standards • impact on installation risks and constraints • impact on cost-effectiveness.

Unit Sector(s)

Unit sector	Fire systems design

Co-requisite units

Co-requisite units	Nil

Competency field

Competency field	