



Australian Government

Department of Education, Employment and Workplace Relations

CPCSFS5006A Create detailed designs for fire sprinkler systems

Release: 1

CPCSFS5006A Create detailed designs for fire sprinkler systems

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	<p>This unit of competency specifies the outcomes required to obtain, process and set up drawings for the detailed design of fire sprinkler systems. The unit also involves assessing and selecting component requirements, setting out the locations of components, and creating final notated drawings.</p> <p>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.</p>
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Application of the Unit

Application of the unit	<p>This unit of competency supports the role of fire systems' designers with responsibility for creating detailed designs for sprinkler fire suppression systems.</p> <p>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.</p>
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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units	Nil
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Employability Skills Information

Employability skills	This unit contains employability skills.
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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.
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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Set up fire systems design drawings.	<p>1.1. Relevant <i>project drawings and documentation</i> are requested, received, named and filed according to workplace procedures.</p> <p>1.2. Drawings are cleaned to leave minimal essential information.</p> <p>1.3. Layers showing designs of other services are imported into clean architectural or structural drawings.</p> <p>1.4. Details from drawings of the floor of the level above are added, if these affect the design.</p> <p>1.5. The detailed design drawings are named, filed and backed up according to workplace procedures.</p>
2. Lay out the fire sprinkler system design.	<p>2.1. A site visit is conducted if possible to confirm dimensions and assess installation risks and constraints.</p> <p>2.2. The exact location of sprinklers is determined and notated on the drawing according to relevant <i>codes and standards</i>.</p> <p>2.3. The most <i>efficient and workable layout and location of sprinkler system components</i> are determined and notated on the drawing according to workplace procedures.</p> <p>2.4. Dimensions are calculated, checked and notated on the drawing according to workplace procedures.</p>
3. Submit drawings for approval and finalise design process.	<p>3.1. Fire sprinkler system design drawings are submitted to relevant personnel within the scheduled timeframe.</p> <p>3.2. Required amendments to design drawings are made or <i>negotiated</i> as required.</p> <p>3.3. Final approved design drawings are processed and distributed according to project and workplace requirements.</p> <p>3.4. <i>Fittings and components</i> are selected and ordered according to project and workplace requirements.</p>

Required Skills and Knowledge

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 and pipe lengths
 - 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 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, for example whichever service is fitted last must fit around existing services

REQUIRED SKILLS AND KNOWLEDGE

- updating knowledge of products, software systems and technology
- reading and interpreting drawings, plans and specifications, including:
 - architectural
 - structural
 - 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
- initiating and running meetings with lead contractor and other service contractors
- 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 fire systems 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
 - spreadsheet
 - email
 - internet
 - proprietary project management software

REQUIRED SKILLS AND KNOWLEDGE

- proprietary hydraulic calculation software
- parametric modelling software, such as Navis-Works or MEP-REVIT
- 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 for 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)
- purpose and operation of fire systems, including:
 - layout
 - system operation
 - performance requirements
 - maintenance standards
 - system activation and operation
- characteristics and limitations of products and materials used in 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
- interconnection of fire systems, including:
 - cause and effect matrix
 - interface with other services
- basic principles of structural engineering
- characteristics of building materials
- construction industry terminology
- roles and responsibilities of relevant building project personnel, including:
 - architect

REQUIRED SKILLS AND KNOWLEDGE

- 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 and other services
- installation methods, including:
 - access requirements
 - health and safety requirements
- fluid mechanics and hydraulics relating to 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 fire systems
 - 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
- principles of organic and inorganic chemistry
- principles of physical sciences, including:
 - Boyle's Law
 - Charles' Law
 - Dalton's Law
 - Henry's Law
- principles of thermodynamics, including:
 - effects of heat
 - stratification of gases
 - smoke and heat dynamics

REQUIRED SKILLS AND KNOWLEDGE

- human psychology, especially fire avoidance behaviour
- contractual processes

Evidence Guide

EVIDENCE GUIDE	
<p>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.</p>	
<p>Overview of assessment</p>	<p>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.</p> <p>This unit could be assessed as an activity involving the effective performance and application of principles relating to the design of fire sprinkler systems for a range of different types of buildings.</p>
<p>Critical aspects for assessment and evidence required to demonstrate competency in this unit</p>	<p>A person who demonstrates competency in this unit must be able to provide evidence of the required skills and knowledge specified within this unit.</p> <p>In particular the person should demonstrate:</p> <ul style="list-style-type: none"> • the ability to: <ul style="list-style-type: none"> • 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 fire sprinkler system designs • interpret and apply fire engineer's designs for alternative solutions • an understanding of technical issues impacting on fire sprinkler system designs • an understanding of the relevant regulatory approval and fire systems design certification processes • the ability to produce fully compliant designs for fire sprinkler systems which also meet client requirements, including: <ul style="list-style-type: none"> • wet pipe • dry pipe

EVIDENCE GUIDE	
	<ul style="list-style-type: none"> • pre-action • early suppression fast response (ESFR) • combination systems • the ability to produce fully compliant designs for fire sprinkler systems for a range of types of sites, including: <ul style="list-style-type: none"> • low-rise buildings • medium-rise buildings • high-rise buildings (over 25 metres) • buildings over 45 metres in height.
Context of and specific resources for assessment	<p>Assessment of essential underpinning knowledge may be conducted in an off-site context. It is to comply with relevant regulatory or Australian standards' requirements.</p> <p>Resource implications for assessment include:</p> <ul style="list-style-type: none"> • 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 relevant manufacturer's information regarding fittings and components.
Method of assessment	<p>Assessment must:</p> <ul style="list-style-type: none"> • 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	<p>Reasonable adjustments for people with disabilities must be made to assessment processes where required. This could include access to</p>

EVIDENCE GUIDE	
	<p>modified equipment and other physical resources, and the provision of appropriate assessment support.</p> <p>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.</p>

Range Statement

RANGE STATEMENT	
<p>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.</p>	
<p><i>Project drawings and documentation</i> may include:</p>	<ul style="list-style-type: none"> • architectural • structural • mechanical • electrical • hydraulic • fire engineer's or estimator's specifications.
<p><i>Codes and standards</i> may include:</p>	<ul style="list-style-type: none"> • 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.
<p><i>Efficient and workable layout and location</i> relate to:</p>	<ul style="list-style-type: none"> • selection of cost-effective components and materials • consideration of: <ul style="list-style-type: none"> • penetrations • conflict with other services • occupational health and safety risks • access constraints • installation problems

RANGE STATEMENT	
	<ul style="list-style-type: none"> • aesthetic requirements • efficiencies to facilitate work on site and reduce labour costing.
<i>Sprinkler system components</i> may include:	<ul style="list-style-type: none"> • discharge nozzles • pipework • brackets • system valves • zone valves • fire panels • specific components for: <ul style="list-style-type: none"> • wet pipe sprinkler systems • deluge and drencher systems • dry pipe sprinkler systems • pre-action sprinkler systems • early suppression fast response (ESFR) systems.
<i>Negotiations</i> regarding amendments to design drawings may arise due to:	<ul style="list-style-type: none"> • non-compliance with applicable legislation, codes and standards • impact on installation risks and constraints • impact on cost-effectiveness.
<i>Fittings and components</i> may include:	<ul style="list-style-type: none"> • hangers • sprinkler heads • elbows • tees • control valves.

Unit Sector(s)

Unit sector	Fire systems design
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Co-requisite units

Co-requisite units	Nil
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Competency field

Competency field	
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