



Australian Government

Department of Education, Employment and Workplace Relations

CPCSFS7001A Define scope of and initiate special hazard fire systems design projects

Release: 1

CPCSFS7001A Define scope of and initiate special hazard fire systems design projects

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit of competency specifies the outcomes required to define the scope of a project to design a complex special hazard fire system and put in place mechanisms to support the design work. The unit addresses the careful clarification of the special hazards project's scope, including an assessment of the level of risk attached to the equipment or facility for which the fire system is being designed, and the development of fire risk solutions. The unit covers the conduct of a thorough analysis of any relevant standards as well as of the project brief itself. Processes to guide and manage the special hazard fire systems design project are also covered. The development of a fire systems design project is subject to significant complexities due to the typical requirement to integrate multiple fire suppression and detection systems. Special hazard fire systems include gaseous, foam and water spray solutions which offer protection for life safety, and to facilities and equipment vital to business operation and success. Special hazard fire systems may fall outside the ambit of the Building Code of Australia. Client requirements may specify use of the U.S. National Fire Protection Association (NFPA) standards. 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.
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Application of the Unit

Application of the unit	This unit of competency supports the attainment of skills and knowledge necessary for the effective and efficient scoping of special hazard fire suppression and detection systems in preparation for the technical development of the design.
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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. Establish relevant project management details.	1.1. Project management roles, responsibilities and lines of communication are established. 1.2. Required project outcomes are consulted, clarified and finalised with the client. 1.3. Relevant project scheduling and sequencing information is established. 1.4. Tasks in the design process are assigned to relevant personnel, and mechanisms to coordinate their input are established and communicated. 1.5. Project file-sharing and communication systems and tools are determined. 1.6. Workplace quality assurance checks to ensure accuracy and validity of design are determined and procedures to ensure that these are conducted are established. 1.7. Stages where regulatory or other approval is required for the design are determined and procedures to ensure that these are obtained are established.
2. Interpret fire systems design concepts, briefs or specifications.	2.1. The nature and purpose of the fire systems design are determined. 2.2. Project documentation is gathered and assessed for completeness and use in the design of effective special hazard fire systems. 2.3. Structural characteristics of the equipment or facility are identified and analysed. 2.4. Functions and occupancies of buildings or facilities are determined from initial project documentation. 2.5. Clarification of specific building details is sought from the client or relevant contractors and consultants. 2.6. The appropriate hazard classification for the building or facility is researched and confirmed.
3. Complete the risk assessment of the project.	3.1. Regulatory requirements and applicable standards for the special hazard fire system are determined. 3.2. Insurance requirements impacting on applicable codes and standards for the special hazard fire system project are determined. 3.3. A risk assessment is documented to identify or confirm the type or types of special hazard detection and suppression system that will be used.

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
- fluent detailed hand-drawing and sketching ability to convey information to on-site workers
- operating computer software packages and systems, including:
 - word processing
 - spreadsheet
 - email
 - internet
 - proprietary project management software
 - proprietary hydraulic calculation software
 - proprietary estimating software
 - parametric modelling software
- using BASIC computer programming language to write logic for electronic system interfaces
- numeracy skills for:
 - calculating:
 - dimensions
 - pipe lengths
 - piping friction loss
 - pump capacity
 - motor output
 - performing calculations for electrical systems:
 - voltage drops

REQUIRED SKILLS AND KNOWLEDGE

- battery capacity
- battery back-up
- power supplies
- performing fluid mechanic calculations
- language and literacy skills for:
 - listening to and communicating clearly with colleagues, fitters, suppliers and contractors
 - participating in meetings, such as negotiations with fire engineering consultant, architect, builder or other service contractor
 - 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
 - reading and interpreting drawings, including:
 - architectural
 - structural
 - mechanical
 - hydraulic
 - electrical
 - report writing
- developing constructive and cooperative working relationships with project team members, workplace colleagues, suppliers, fitters and clients
- negotiation and conflict management
- initiating and running meetings with lead contractor and other service contractors
- project 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 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:

REQUIRED SKILLS AND KNOWLEDGE

- 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
- fire engineering principles, including:
 - engineered solutions
 - innovative fire systems
 - fire modelling
- proprietary fire engineering and modelling programs
- parametric modelling of services coordination using proprietary software, such as Navis-Works or MEP-REVIT
- computer software functions and operation, including:
 - word processing
 - spreadsheet
 - email
 - internet
 - proprietary project management software
 - proprietary hydraulic calculation software
 - proprietary estimating 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
 - other fire system standards commonly required by building insurers
- protection requirements for different buildings, including the existence of special zones, the egress requirements of occupants, and the construction materials used
- 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
- fire systems' technology and components, including:

REQUIRED SKILLS AND KNOWLEDGE

- 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
- detection and warning systems, including:
 - emergency warning and intercommunications systems (EWIS)
 - fire detection and alarm systems
 - smoke control systems
 - emergency lighting systems
- special hazard fire systems, including:
 - foam systems (low expansion, medium expansion and high expansion)
 - gaseous agent systems (carbon dioxide, inert gas and halocarbon gases)
 - water spray systems (deluge, medium/high velocity water spray and high speed deluge)
- chemical systems, including:
 - powder
 - wet chemical
- purpose and operation of fire systems, including:
 - layout
 - special products and hazards
 - 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 capability
- interconnection of fire systems, including:
 - cause and effect matrix
 - interface with other services
- instruments used in commissioning and measuring fire system performance
- basic principles of structural engineering
- characteristics of building materials
- construction industry terminology

REQUIRED SKILLS AND KNOWLEDGE

- 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 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 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

REQUIRED SKILLS AND KNOWLEDGE

- Hazen-Williams equation
- Darcy-Weisbach equation
- computational fluid dynamics
- electrical calculations (alarm systems), including:
 - voltage drops
 - battery sizes
 - battery back-up
 - power supplies
 - cabling range
 - system calculations for gas or special hazard fire systems
- principles of organic and inorganic chemistry, including basic chemical reactions and substances
- principles of basic physics, including an understanding of:
 - 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
- electrical and electronics theory, including:
 - units used to measure current (AC and DC), power, capacitance, inductance and sound attenuation
 - effects of AC and DC current in series and parallel circuit paths that includes resistive, inductive and capacitive loads
 - relationship between voltage drops around a circuit and applied voltage
 - definition of voltage ratings as defined in communication and electrical safety regulations, including extra low voltage, low voltage and hazardous voltages
 - layout of electrical wiring systems to meet communication and electrical safety regulations applicable to fire detection and warning systems
 - basic operation of common electronic and electrical components used in fire detection and warning systems
 - basic operation of communication protocols on addressable systems, peripheral devices (printers) and high-level interfaces to other communication devices used in fire detection and warning systems
- acoustics and speech intelligibility for occupant warning systems
- human psychology, especially fire avoidance behaviour
- organisational frameworks and functions, including:

REQUIRED SKILLS AND KNOWLEDGE

- industry associations
- enterprises
- government bodies
- financial management, including:
 - budgeting
 - cost-effectiveness
- contractual processes
- risk management 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 determination of the scope of and initiation of a range of fire systems designs for special hazards projects. This entails establishing effective project management processes; correctly interpreting design concepts, briefs or specifications; and conducting risk management processes to ensure the selection of appropriate fire detection and suppression systems that reflect client requirements and are compliant with relevant codes, standards and legislation.

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:

- project management skills to coordinate, schedule, resource and oversee the completion

EVIDENCE GUIDE

	of special hazard projects • the ability to read and interpret a range of design documents, including concept briefs, design briefs, drawings, plans and specifications • knowledge of fire sciences sufficient to ensure the design of compliant and effective systems that address the specific conditions of the projects being undertaken • an understanding of and ability to apply legislation, codes, standards, and regulatory and insurance requirements that may apply to special hazard fire systems design projects, including U.S. NFPA standards • the ability to conduct risk assessment processes.
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EVIDENCE GUIDE	
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: • access to Australian and international codes and standards • access to legislation relevant to the jurisdiction • project documentation, including design brief, design drawings, specifications, construction schedules and other supporting documents • research resources, including product information and data • theoretical texts and other information to support the assessment of the unit's required skills and knowledge • relevant computer software packages and suitable hardware.
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.
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

EVIDENCE GUIDE

	relation to the competency being assessed.
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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.

<i>Fire systems design</i> projects:	- are defined as those projects that are developed as a fire risk solution to offer protection against business interruption by providing fire protection to specific equipment or facility, whose performance-based principles are often outside the ambit of the Building Code of Australia - must respond to the requirements specified by the client or the client's insuring body and may include the application of international standards for fire systems.
<i>Project documentation</i> includes:	- fire engineer's design concepts and recommendations - construction drawings and plans - specific layout plans for other services, including plumbing, electrical and air conditioning.
<i>Structural characteristics</i> of the building or facility include:	- fabrication methods used - size and layout.
<i>Equipment or facility</i> that will require special hazard fire systems includes that which stores high value or high risk assets, including:	- data centres - computer rooms - electrical substations - documents (e.g. libraries and archives) and other collections (e.g. art galleries and museums) - fuel and gas storage and refineries - aeroplane hangars - chemical factories

RANGE STATEMENT	
	• warehouses containing highly volatile materials • any other storage facility for very high value individual items that would be destroyed by water-based fire suppression systems.
<i>Regulatory requirements and applicable standards:</i>	• will typically include references to U.S. NFPA standards, including: • NFPA 2001 Clean Agent Fire Extinguishing Systems • NFPA 11 Low, Medium and High Expansion Foam Systems • NFPA 13 The Installation of Sprinkler Systems • NFPA 15 Water Spray Fixed Systems for Fire Protection • NFPA 16 Deluge Foam-Water Sprinkler and Foam-Water Spray Systems • NFPA 750 Water Mist Fire Protection Systems • relevant Australian standards, including: • AS4214 Gaseous fire extinguishing systems • AS2118 Automatic fire sprinkler systems Parts 1 to 6 • AS1670 Fire detection, warning control and intercom systems System design, installation and commissioning • AS1940 The storage and handling of flammable and combustible liquids • AS4360 Risk management • AS4587 Water mist fire protection systems • also note: • increasingly, international ISO standards are being identified for the industry • special hazard fire systems are not referenced in the Building Code of Australia.

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	Senior management
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