



Australian Government

CPCSFS8001 Define scope of and initiate special hazard fire systems design projects

Release: 1

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Modification History

Release 1.

This version first released with CPC Construction, Plumbing and Services Training Package Version 1.

Replaces superseded equivalent CPCSFS7001A Define scope of and initiate special hazard fire systems design projects.

Application

This unit of competency specifies the outcomes required to define the scope of a project that designs a complex special hazard fire system, and put in place mechanisms to support the design work.

The unit addresses the careful clarification of the scope of a special hazard fire system project, including assessing the level of risk attached to the equipment or facility for which the fire system is being designed, and developing 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 (SHFSD) project are also covered in this unit.

Special hazard fire systems are not referenced in the National Construction Code (NCC). They include gaseous, foam, and water spray solutions that offer protection for life safety and to facilities and equipment vital to business operation and success.

This unit of competency supports the attainment of skills and knowledge necessary for the effective and efficient scoping of special hazard fire detection and suppression systems in preparation for the technical development of the design.

No licensing, legislative, accreditation, regulatory or certification requirements apply to this unit at the time of endorsement.

Pre-requisite Unit

Nil

Competency Field

Fire system design

Unit Sector

Plumbing and services

Elements and Performance Criteria

Elements describe the essential outcomes.

Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the range of conditions.

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|---|--|
| 1. Establish relevant project management details and protocols. | 1.1. Nature and purpose of the <i>special hazard fire systems design project</i> are determined. |
| | 1.2. Project management roles, responsibilities and lines of communication are established. |
| | 1.3. Required project outcomes are consulted, clarified and finalised with the client. |
| | 1.4. Relevant project scheduling and sequencing information is established. |
| | 1.5. Tasks in the design process are assigned to relevant personnel, and mechanisms to coordinate their input are established and communicated. |
| | 1.6. Project <i>file storage</i> , sharing and communication systems and tools are determined. |
| | 1.7. Workplace quality assurance checks are determined and procedures to ensure that they are conducted are established. |
| | 1.8. Stages where regulatory or other approval is required for the design are determined and procedures to ensure that approvals are obtained are established. |
| 2. Interpret fire systems design concepts, briefs and specifications. | 2.1. <i>Project documentation</i> is gathered, analysed, assessed for completeness, and stored and shared for use in the design of effective special hazard fire systems. |
| | 2.2. <i>Structural characteristics</i> of <i>special hazard site</i> are identified and analysed. |
| | 2.3. Functions and occupancies of building or facility are determined from initial project documentation. |
| | 2.4. Clarification of specific building details is sought from client or relevant contractors and consultants. |
| | 2.5. Appropriate hazard classification for building or facility |

is researched and confirmed.

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|----|--|------|---|
| 3. | Complete risk assessment of the project. | 3.1. | <i>Regulatory requirements and applicable standards</i> 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. | Prior to commencing design work, risk assessment report is <i>documented</i> that identifies or confirms the type or types of special hazard detection and suppression system that will be used. |

Foundation Skills

This section describes core skills that are essential to performance and not explicit in the performance criteria. Employment skills essential to performance are explicit in the performance criteria of this unit of competency.

Skill	Performance feature
Learning skills to:	- attempt complex tasks requiring sophisticated conceptualisation and analysis over an extended period and employ lateral thinking and problem solving strategies - manage detailed input into concurrent fire systems design projects at different stages of the process and with diverse sets of regulatory requirements - select and use a range of ICT tools for file and project management and research.
Numeracy skills to:	- interpret and apply complex mathematical principles, equations and calculation methods to the design of special hazard fire systems - read, measure and interpret dimensions, ratios and scales on drawings.
Oral communication skills to:	- lead and participate in project meetings and consultations with a range of service contractors - listen to and communicate clearly with clients, colleagues and contractors using specialised vocabulary specific to fire systems.

This section describes core skills that are essential to performance and not explicit in the performance criteria. Employment skills essential to performance are explicit in the performance criteria of this unit of competency.

- Reading skills to:
- recognise distinguishing structures, layout, features and conventions of a range of complex texts and use them to locate information
 - use a range of reading strategies to maintain comprehension and integrate concepts relating to SHFSD projects.
- Writing skills to:
- prepare risk assessment reports with content organised in a clear and logical structure, using technical vocabulary and explanations where required
 - write to construction and fire safety specialists about such things as notifications of incompleteness, and conflicts and errors in drawings supplied by other service contractors.

Range of Conditions

This section specifies work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included. Bold italicised wording, if used in the performance criteria, is detailed below.

- Special hazard fire systems design projects*** must include:
- at least one of the following systems:
 - foam systems
 - gaseous agent systems
 - water spray systems
 - projects developed as a fire risk solution preventing business interruption by providing fire protection to specific equipment or a special facility, where the performance-based principles are not covered by the NCC
 - compliance with the requirements specified by the client or the client's insuring body, including the application of Australian and international standards for fire systems.
- File storage*** must include:
- accurate naming and filing of drawings
 - formal document control and amendments, including:
 - history

- transmittal notices.

Project documentation must include:

- construction drawings and plans detailing the specific equipment or special facility requiring the special hazard fire system
- fire engineer's design concepts and recommendations
- specific layout plans for other services, including plumbing, electrical and air conditioning.

Structural characteristics of building or facility must include:

- fabrication materials and methods used
- size and layout of building or facility.

Special hazard site must include at least two different sites from the following list:

- aeroplane hangars
- computer rooms
- chemical factories
- data centres
- documents and other collections in buildings, including libraries, archives storage, art galleries and museums
- electrical substations
- fuel and gas storage and refineries
- 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.

Regulatory requirements and applicable standards must include at least one standard from the following list:

- Australian standards:
 - AS ISO 14520.1 Gaseous fire-extinguishing systems - Physical properties and system design - General requirements
 - AS1670 Fire detection, warning control and intercom systems - System design, installation and commissioning
 - AS1940 The storage and handling of flammable and combustible liquids
 - AS2118 Automatic fire sprinkler systems Parts 1 to 6
 - AS2941 Fixed fire protection installations - Pumpset systems
 - AS4360 Risk management
 - AS4487 Condensed aerosol fire extinguishing systems -

Requirements for system design, installation and commissioning and test methods for components

- AS4587 Water mist fire protection systems
- United States National Fire Protection Association (NFPA) standards:
 - 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.

Documentation for risk assessment must include drawings that detail:

- layout
- section
- detail
- external references
- freezing layers.

Unit Mapping Information

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

Links

Companion Volume implementation guides are found in VETNet -

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

Assessment Requirements for CPCSFS8001 Define scope of and initiate special hazard fire systems design projects

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Performance Evidence

A person demonstrating competency in this unit must satisfy all of the elements, performance criteria and foundation skills of this unit. The person must define the scope of and initiate two special hazard fire systems design (SHFSD) projects for special hazard sites as outlined in the range of conditions.

For each project, the person must:

- establish and communicate project parameters and task allocation, coordination and scheduling
- ensure systems are in place for project communication, file management, quality assurance and regulatory approvals
- define the requirements for the SHFSD
- gather and conduct a detailed analysis of project documentation relating to:
 - structural characteristics
 - functions and occupancies
- read and interpret notations and measure and interpret dimensions, ratios and scales on drawings, including:
 - architectural
 - electrical
 - hydraulic
 - mechanical
 - structural
- confirm the hazard classification for the special hazard site and determine applicable compliance and requirements, including those specified by insurers
- produce a risk assessment confirming the type or types of special hazard detection and suppression system that will be designed for the special hazard site, ensuring that the systems are compliant and effective and address the specific conditions of the project.

In particular the person should demonstrate:

- project management skills to coordinate, schedule, resource and oversee the initiation of two SHFSD projects
- the ability to read and interpret a range of design documents, including concept briefs, design briefs, drawings, plans and specifications
- the ability to apply legislation, codes, standards, and regulatory and insurance requirements that may apply to SHFSD projects, including Australian and United States National Fire Protection Association (NFPA) standards
- the ability to conduct risk assessment processes.

Knowledge Evidence

A person demonstrating competency in this unit must be able to demonstrate knowledge of:

- electrics 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 include 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
- basic principles of structural engineering
- construction industry terminology used in project documentation and relevant standards
- contractual processes
- current legislation, regulations, codes and standards applicable to SHFSD, including:
 - building Acts and regulations
 - infrastructure supply regulations
 - Australian standards for fire systems
 - National Construction Code (NCC)
 - other fire system standards commonly required by building insurers, including NFPA standards and International Organization for Standardization (ISO) standards
- financial processes and calculations required to support commercially sound SHFSD projects, including:
 - budgeting
 - cost-effectiveness
- level of accuracy required in detailed design drawings

- mathematical principles, equations and calculation methods required for SHFSD, including:
 - trigonometry 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
 - electrical calculations for alarm systems, including:
 - voltage drops
 - battery sizes
 - battery back-up
 - power supplies
 - cabling range
 - system calculations for gas or special hazard fire systems
 - other calculations, including:
 - motor output
 - piping friction loss
 - pump capacity
- naming conventions for design drawings and drawing register
- organisational frameworks and functions, including:
 - industry associations
 - enterprises
 - government bodies
- principles of basic physics, including:
 - Boyle's Law
 - Charles' Law
 - Dalton's Law
 - Henry's Law
- principles of fire engineering, including:
 - engineered solutions
 - innovative fire systems
 - fire modelling
- principles of 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
- human psychology especially fire avoidance behaviour
- range of fire protection technologies suitable for SHFSD projects, including:
 - 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
 - water-based systems, including:
 - deluge and drencher
 - dry pipe sprinkler
 - early suppression fast response (ESFR)
 - fire pumpsets
 - hydrants, hose reels and monitors
 - pre-action sprinkler
 - water supply tanks
 - wet pipe sprinkler
 - water supplies, including:
 - booster configurations
 - common water sources
 - conservation requirements
 - in-ground reticulation
 - fluid mechanics and hydraulics relating to:
 - pipe range
 - pressure
 - pressure vessels
 - pump selection
 - tank selection
 - water supply
 - detection and warning systems, including:
 - emergency lighting systems
 - emergency warning and intercommunication systems (EWIS)
 - fire detection and alarm systems
 - smoke control systems

- chemical systems, including:
 - powder
 - wet chemical
- purpose and operation of fire systems, including:
 - characteristics and limitations of products and materials used in fire systems and issues relating to material capability
 - layout
 - maintenance standards
 - performance requirements
 - special products and hazards
 - system activation and operation
 - system operation
- pipe fabrication methods and constraints
- interconnection of fire systems, including:
 - cause and effect matrix
 - interface with other services
- sustainability requirements relevant to the project:
 - energy conservation
 - water conservation
- principles of organic and inorganic chemistry, including basic chemical reactions and substances
- principles of thermodynamics, including:
 - effects of heat
 - stratification of gases
 - smoke and heat dynamics
- protection requirements for different buildings, including:
 - consideration of construction materials used
 - egress requirements of occupants
 - existence of special zones
- risk management processes
- requirements for installation:
 - access requirements
 - work health and safety requirements
- roles and responsibilities of relevant building project personnel
- types of workplace design and project management tools, and processes suitable for scoping and initiating SHFSD projects, including:
 - proprietary fire engineering and modelling programs
 - parametric modelling of services coordination using proprietary software, such as Navis-Works or MEP-REVIT.

Assessment Conditions

Assessment must be conducted in the workplace or a close simulation of the workplace.

Suitable assessment of performance would require:

- equipment:
 - computer with internet and email access
 - software: word processing and spreadsheet functionality; parametric modelling; and proprietary estimating, hydraulic calculation, and project management
- materials:
 - access to current legislation, codes and standards relevant to the jurisdiction in which the work is taking place, including:
 - building Acts and regulations
 - infrastructure supply regulations
 - Australian standards for fire systems
 - NCC
 - other fire system standards commonly required by building insurers, including NFPA standards and ISO standards
 - project documentation, including design briefs, design drawings, specifications, construction schedules and other supporting documents.

Assessor requirements

Assessors must satisfy the assessor requirements in the Standards for Registered Training Organisations (RTOs) current at the time of assessment.

Links

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