



Australian Government

Department of Education, Employment and Workplace Relations

PRMPFES51A Design gaseous fire suppression systems

Release: 1

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Modification History

Not Applicable

Unit Descriptor

Unit descriptor

This unit of competency specifies the outcomes required to design a gaseous fire suppression system and to generate design documentation and installation drawings in accordance with relevant standards, codes and regulations. All work in this area must comply with relevant legislative, industry, customer and organisational requirements, including policies and procedures relating to ozone depleting substances (ODS), synthetic greenhouse gases (SGG) and occupational health and safety (OHS).

Note: RTOs must ensure candidates in this unit have appropriate background knowledge in:

- fluid design (hydraulic and pneumatic) relating to fire protection systems
- fire chemistry (chemistry of extinguishing agents) relating to fire protection systems
- physics (force, energy, pressure, etc.) relating to fire protection systems
- theory of combustion
- physiology of respiration.
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Application of the Unit

Application of the unit

This unit of competency supports the development of fire suppression system design skills and knowledge that can be used throughout the Australian fire protection industry.

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Not Applicable

Employability Skills Information

Not Applicable

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency. Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT

PERFORMANCE CRITERIA

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| <p>1 Interpret and comply with legal and industry requirements relating to gaseous fire suppression system design.</p> | <p>1.1 Apply knowledge and understanding of legislative requirements, including the Building Code of Australia (BCA) and relevant state and territory regulations, to gaseous fire suppression system design.</p> <p>1.2 Apply knowledge and understanding of legislative and industry requirements to work procedures and clarify where necessary with relevant persons.</p> <p>1.3 Identify potential and actual breaches of legislative and industry requirements and take action according to organisational requirements.</p> |
| <p>2 Establish system design requirements.</p> | <p>2.1 Gather and analyse information to identify system design requirements.</p> <p>2.2 Perform a fire risk management assessment of the site.</p> <p>2.3 Document design requirements.</p> <p>2.4 Identify and document constraints on design.</p> <p>2.5 Develop suitable strategies to address identified constraints.</p> <p>2.6 Create appropriate records and complete design requirement documentation according to work procedures.</p> |
| <p>3 Create and quantify system design.</p> | <p>3.1 Identify and quantify critical dimensions and system data of initial design.</p> <p>3.2 Create initial design based on identified design requirements and constraints.</p> <p>3.3 Confirm initial design is reviewed by relevant persons to check function, physical requirements and site impact.</p> <p>3.4 Include variations and modifications into initial design according to feedback provided.</p> <p>3.5 Identify documentation requirements for the initial design and associated installation processes.</p> <p>3.6 Prepare draft design documentation to include installation notes, calculations and a commissioning checklist for the system.</p> <p>3.7 Prepare draft installation drawings to required accuracy.</p> |

ELEMENT**PERFORMANCE CRITERIA**

- 3.8 Calculate draft estimates of required materials, components and related costs in conjunction with other relevant persons.
- 3.9 Prepare **bill of materials** based on **initial design**.
- 3.10 Evaluate **initial design** documentation, **installation drawings** and **commissioning checklist** against customer requirements and, where needed, quotation or tender submission requirements.
- 3.11 Undertake **initial design** review with customer and document outcomes.
- 4 Modify and finalise system design and documentation.
- 4.1 Modify **initial design**, incorporating review and evaluation feedback from customer and other relevant persons.
- 4.2 Test and evaluate design requirements to confirm suitability.
- 4.3 Document modifications and test results.
- 4.4 Review and finalise design calculations, costings and **bill of materials**.
- 4.5 Complete and document **final design** documentation, calculations, **installation drawings** and **commissioning checklist**.
- 4.6 Prepare 'as installed' designs and technical data schedules to customer's needs.
- 4.7 Process **final design** documentation for approval and store and distribute according to **organisational procedures**.
- 4.8 Create appropriate records and complete **documentation** according to **work procedures**.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- analyse risk, detection specifications and building or protected area requirements for system
- conduct a fire risk assessment to Australian and international standards
- interpret construction design documents
- read specifications, contracts, site plans and quotation or tender briefs

- use measuring equipment
- problem-solving and critical analysis
- use design and calculation software
- develop system design incorporating electrical, mechanical and structural design elements
- produce computerised system design using software specific to gaseous agent
- manage design changes and variations
- create computerised designs from hard copy
- operate printing and plotting equipment
- project planning and management
- electronic file transfer, internet and email skills
- source, organise and record information
- plan and organise work in order to estimate time to complete activities and prioritise tasks
- use effective customer service skills and relate to people from a range of social, cultural and ethnic backgrounds and with a range of physical and mental abilities
- apply language, literacy and numeracy skills to:
 - communicate with others in a clear and concise manner in verbal, non-verbal and written modes
 - read, understand and comply with work instructions and specifications
 - read, understand and record measurements.

Required knowledge:

- gaseous fire suppression system design
- operation of discharge valve assembly and manifold connection components
- types and operation of actuation control devices and actuation mechanisms
- specific requirements for fire alarm systems suitable for gaseous fire protection systems
- types of extinguishing agents applicable to specific types of fire risk
- properties of gaseous agents
- relationship between gaseous agent properties and risk reduction strategies
- requirements to perform fire risk management assessment of a site
- factors that determine and control extinguishing agent concentration
- piping standards that apply to gaseous fire suppression system designs
- products available for use in creating gaseous fire suppression system designs
- interpretation of manufacturer data sheets to extract design requirement for equipment
- access and installation practices applicable to gaseous fire suppression systems and components
- maintenance requirements for designed system
- key features of legislation, regulations, codes and Australian standards applicable to gaseous fire suppression system designs
- fire industry codes of practice
- state-specific fire authority requirements
- purpose of the Building Code of Australia (BCA)
- implications of **not** applying legislative requirements to job functions
- methods of converting units of measurement
- relevant federal, state or territory legislation that affects organisational operations, including:
 - anti-discrimination and diversity
 - equal employment opportunity
 - industrial relations.

KEY COMPETENCIES

The seven key competencies represent generic skills considered necessary for effective participation by an individual in the workplace.

Performance level 1 - at this level the candidate is required to undertake tasks effectively.

Performance level 2 - at this level the candidate is required to manage tasks.

Performance level 3 - at this level the candidate is required to use concepts for evaluating and reshaping tasks.

Key competency	Example of application	Performance level
How are ideas and information communicated?	Discuss, confirm and document customer requirements in a clearly structured and defined manner.	2
How can information be collected, analysed and organised?	Gather information from a number of sources, including regulatory, customer, manufacturer and organisational sources, and analyse to confirm system design work meets design specifications and requirements.	3
How are activities planned and organised?	Plan system design activities to suit customer and organisational requirements.	3
How is teamwork used?	Apply consultative and collaborative approaches through support and assistance provided to customers and work groups.	2
How are mathematical ideas and techniques used?	Apply complex mathematical techniques to system design activities.	3
How are problem-solving skills applied?	Identify and apply problem-solving throughout system design activities while considering ambiguous information received from information sources, potential risks and due processes to be followed when unusual problems are encountered.	3
How is the use of technology applied?	Demonstrate sound technical knowledge and use of appropriate technology when organising, recording and presenting system design information.	3

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, the range statement and the Assessment Guidelines for this Training Package.

Overview of assessment

- Competency in this unit underpins competency in other aspects of the candidate's role in managing their work tasks.
- This unit could be assessed on its own or in combination with other units of competency relevant to the job function.

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:
 - locating, interpreting and applying relevant information, standards and specifications
 - creating designs for gaseous fire suppression systems based on two different gaseous extinguishing agents
 - complying with site safety plan, OHS regulations, ODS and SGG regulations (where required) and state and territory legislation applicable to workplace operations
 - complying with organisational policies and procedures, including quality requirements
 - communicating and working effectively and safely with others
 - in a minimum of two different settings:
 - identifying legal and industry requirements that apply to system design
 - analysing system design requirements
 - identifying and confirming system and site measurements, critical dimensions and system data
 - identifying risk requirements
 - identifying constraints to system design
 - developing strategies to address identified constraints
 - identifying and selecting appropriate products, extinguishing agents, hardware and components for use in system design
 - incorporating variations and modifications into system design
 - completing system design calculations
 - drafting system design drawings

	• preparing bill of materials for system design • identifying installation and commissioning procedures for system design • identifying safety procedures to be followed during installation and commissioning procedures • creating installation and commissioning documentation for system and components, pipes, fittings, actuation control devices, activating mechanisms and auxiliary shutdown interface, as required.
Specific resources for assessment	• Resource implications for assessment include access to: • actual or simulated work environment, including gaseous fire suppression system software • customer specifications, tender or quotation documentation, and installation and maintenance requirements for a gaseous fire suppression system design • assessment documentation, including training and assessment record books • all necessary tools, specialist equipment, materials and spare parts • relevant manuals and other documentation, including Australian standards. • Where applicable, physical resources should include equipment modified for people with disabilities. • Access must be provided to appropriate learning and/or assessment support when required. • Assessment processes and techniques must be culturally appropriate, and appropriate to the oracy, language and literacy capacity of the candidate and the work being performed.
Context of assessment	• For valid and reliable assessment of this unit, competency should be demonstrated over a period of time and be observed by the assessor (or assessment team working together to conduct the assessment). • Competency is to be demonstrated in a range of situations, reflecting the practical requirements of the workplace which may include customer and workplace interruptions and involvement in related activities normally experienced in the workplace. • Assessment of competency over the full range of performance criteria may be made through practical demonstrations in the work place. Consideration should be given to assessing consistency of outcome

over an appropriate period of time.

- Candidates should also be given the opportunity to practise and undertake self-assessment of performance before requesting formal assessment.
- All safety requirements must be adhered to during all practical activities.
- Oral questioning or a written assessment may be used to assess underpinning knowledge. (In assessment situations, where the candidate is offered a preference between oral questioning and written assessment, questions are to be identical.)
- Assessment of evidence should establish the candidate's ability to perform the job to the standard required in the workplace.
- Supplementary evidence may be obtained from relevant authenticated correspondence or reports from supervisors or team leaders that demonstrate an understanding of the requirements for gaseous fire suppression system design.
- Candidate should be encouraged to compile a portfolio of examples of completed documentation relevant to the candidate's organisation. One accurate example of each completed document is suggested as sufficient to infer competency and ability to transfer appropriate skills to each document type when required in the workplace. (Oral questioning may contribute as evidence of this ability.)
- Information derived from enterprise policies and practices must be treated as commercial-in-confidence.
- In all cases where practical assessment is used it will be combined with targeted questioning to assess the underpinning knowledge.
- Questioning will be undertaken in such a manner as is appropriate to the oracy, language and literacy levels of the candidate and any cultural issues that may affect responses to the questions. It will reflect requirements of the unit of competency and the work being performed.
- Where assessment is for the purpose of recognition (RCC or RPL), the evidence provided will need to be authenticated and show that it represents current competency demonstrated over a period of time.
- Performance and assessment of this unit must be carried out within the relevant requirements of the following legislative and industry framework:

- building Acts, regulations and codes
- Australian and international standards identified as relevant to gaseous fire suppression design
- environmental regulations
- manufacturer specifications
- organisational requirements, including policies and procedures relating to ODS, SGG and OHS
- OHS legislation, codes and regulations
- ODS and SGG legislation, codes and regulations.

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 in the performance criteria is detailed below. Add any 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.

Legislative requirements may include:

- relevant current Australian standards, including AS 4214
- relevant federal, state and territory building Acts, regulations and codes, such as *Ozone Protection and Synthetic Greenhouse Gas Management Act 1989*
- relevant international standards, including NFPA 2001 and related ISO standards
- fire industry codes of practice
- Building Code of Australia (BCA)
- building surveyor requirements, such as occupancy permits
- OHS legislation, codes and regulations
- dangerous goods regulations
- licensing arrangements
- environmental regulations, including ODS and SGG legislation, codes and regulations
- other relevant legislation relating to fire protection equipment, including international, shipping and marine codes
- Australian petroleum industry requirements.

Work procedures may include:

- instructions from colleagues, supervisors and managers
- specific customer requirements

- assignment instructions
 - equipment manufacturer requirements
 - reporting and documentation requirements
 - ODS, SGG and OHS requirements
 - personal protective equipment (PPE) requirements.
- Relevant persons** may include:
- team leaders
 - supervisors
 - managers
 - colleagues
 - customers.
- Potential and actual breaches** could be identified by:
- direct observation
 - workplace quality assurance teams.
- Organisational requirements** may include:
- legal and organisational policies and guidelines
 - personnel practices and guidelines outlining work roles, responsibilities and delegations
 - legislation relevant to the design of gaseous fire suppression systems
 - OHS policies, procedures and programs
 - procedures and work instructions to prevent the emission of ODS and SGG in the workplace
 - documentation and information systems and processes
 - use of electronic job scheduling and communication devices.
- Constraints** may include:
- specification of works
 - regulatory and authority requirements
 - availability of components
 - alterations to building design.
- Documentation** may include:
- specifications
 - tender designs
 - contract reference designs
 - insurance reports
 - bill of materials and quantities for construction design
 - calculations
 - materials listings.
- Initial design** may include:
- system concepts
 - preliminary calculations.
- Variations** may include:
- changes by other trades
 - changes to the structure
 - changes of design criteria

- Modifications** may include:
- additional requirements by authorities.
 - project-specific deviations from design documents' codes and standards
 - specific structural constraints.
- Commissioning checklist** may include checking:
- fire alarm is connected
 - type of equipment connected to fire alarm
 - area is fire-rated and level of rating
 - penetrations are properly gas-sealed
 - audio and visual alarms
 - purge ventilation system is provided
 - volume of room(s)
 - if pipework and valving was subject to hydrostatic test
 - if gas container storage area is covered by detection
 - floor tiles for under-floor detector location
 - operation of actuation control devices and activating mechanisms
 - if door release and damper release switches are fitted
 - visual notification at fire indicator panel
 - if air conditioning shutdown isolation (via a panel zone or door switch) is operable.
- Installation drawings** may include:
- plan views
 - elevation and section details
 - specific details
 - schematics
 - pipe construction and joining methods
 - operational equipment details
 - calculation data
 - details of all elements affecting the design
 - reference to relevant codes and standards
 - all detail as per relevant design standard.
- Bill of materials** may include:
- accurate description of all materials
 - quantity and cost of all materials
 - contingency expenses.
- Final design** may include:
- electrical, mechanical and structural design elements
 - 'as installed' adjustments
 - 'as installed' calculations.

Unit Sector(s)

Sector

Fire Protection Equipment

Competency field

Competency field

Asset Maintenance