Unit of Competency CPCSFS5017 Create detailed designs for foam suppression systems

Application

This unit of competency specifies the skills and knowledge required to obtain, process and set up drawings for the detailed design of foam suppression systems. The unit also involves assessing and selecting component requirements, setting out the locations of components, and creating final notated drawings.

This unit of competency supports the role of fire systems designers with responsibility for creating detailed designs for sprinkler fire suppression systems.

Fire systems designs are limited to those within the deemed-to-satisfy provisions of the Building Code of Australia (BCA) 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, 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.

Prerequisite Unit

Nil.

Elements and Performance Criteria

1. Set up fire systems design drawings.	1.1	Request, receive, name and file relevant project drawings and documentation according to workplace procedures.
	1.2	Clean drawings to leave minimal essential information.
	1.3	Import layers showing designs of other services into clean architectural or structural drawings.
	1.4	Add details from drawings of the floor of the level above, if these affect the design.
	1.5	Name, file and back up the detailed design drawings according to workplace procedures.
2. Perform preliminary data and calculations.	2.1	Develop floor area calculations to determine the number of sprinklers zones and required fire hydrant to be considered flowing.
	2.2	Determine the town main capabilities for the fire services serving the site.
	2.3	Determine the types of foams applicable for the site.
	2.4	Determine the minimum hydrant flow for the site.
	2.5	Determine the initial fire flow demands for the site based on the occupancy classifications.
	2.6	Analyse the town main water supply capabilities to determine if fire pumps and fire tanks are required.
	2.7	Calculate the proposed fire pump flows and pressure and fire tanks sizes.

	2.8	Prepare dimensional drawings for equipment spatial allocations.
	2.9	Sight fire brigade response point, boosters and tank suction points with stakeholders.
	2.10	Prepare a comparison list of equipment which can be used across the site.
3. Lay out the foam suppression system design.	3.1	Confirm dimensions and assess installation risks and constraints.
	3.2	Determine and notate the exact location of foam nozzles on the drawing according to relevant codes and standards.
	3.3	Determine and notate the most efficient and workable layout and location of sprinkler system components on the drawing according to workplace procedures.
	3.4	Design pipework layout and coordinate with building elements and services and identify pipework sizes and elevations across the system(s).
	3.5	Calculate, check and notate dimensions on the drawing according to workplace procedures.
	3.6	Undertake hydraulic analysis of the fire systems using both hand calculation procedures and computer modelling programs.
	3.7	Validate fire pump and tanks sizes versus initial estimates.
	3.8	Develop detail designs of pipework for complicated interaction of pipework and building elements and services.
	3.9	Develop detail designs of pipework configurations for fire tanks, fire pumps, brigade booster and suction points, alarm valves including manifold systems, and flow switch arrangements.
	3.10	Develop detail designs of pipework configurations for the foam tanks, foam pumps, injections devices and alarm valves.
4. Submit drawings for approval and finalise design process.	4.1	Submit foam suppression system design drawings to relevant personnel within the scheduled timeframe.
	4.2	Make or negotiate required amendments to design drawings as required.
	4.3	Process and distribute final approved design drawings according to project and workplace requirements.
	4.4	Select and order fittings and components according to project and workplace requirements.

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Unit Mapping Information

No equivalent unit.

Links

Companion Volume Implementation Guide: https://vetnet.education.gov.au/Pages/TrainingDocs.aspx?q=7e15fa6a-68b8-4097-b099-030a5569b1ad

Assessment Requirements for CPCSFS5017
Create detailed designs for foam suppression systems

Performance Evidence

To demonstrate competency, a candidate must meet the performance criteria of this unit by:

- effectively designing three different foam suppression systems for three different building types.

Knowledge Evidence

To be competent in this unit, a candidate must demonstrate knowledge of:

- workplace design tools and processes:
    - effective and workable layout and location:
        - selection of cost-effective components and materials
        - consideration of:
            - penetrations
            - conflict with other services
            - work health and safety risks
            - access constraints
            - installation problems
            - aesthetic requirements
            - efficiencies to facilitate work on site and reduce labour costing
    - negotiations regarding amendments:
        - non-compliance with applicable legislation, codes and standards
        - impact on installation risks and constraints
        - impact on cost-effectiveness
- relevant regulatory approval and fire systems design certification processes
- level of accuracy required in detailed design drawings
- naming conventions for design drawings and drawing register
- foam suppression systems using a range of water supplies, including:
    - town main
    - town main and elevated tank
    - town main with a 100% capacity tank
    - town main with a partial capacity tank
    - tank supply with multiple tank
    - water supply using dams, rivers and sea water
- fire science:
    - 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:
    - word processing
    - spreadsheet
    - email
    - internet
    - proprietary hydraulic calculation software
    - proprietary estimating software
    - parametric modelling software, such as Navis-Works or MEP-REVIT
- relevant current legislation, codes and standards:
    - building Acts
    - building regulations
    - infrastructure supply regulations
    - the Building Code of Australia (BCA)
    - National Construction Code (NCC)
    - Australian standards for fire systems
    - international standards for fire systems
    - other fire system standards commonly required by building insurers
- fire systems technology and components for foam suppression systems:
    - discharge nozzles
    - pipework
    - brackets
    - system and control valves
    - zone valves
    - fire panels
    - hangers
    - fittings
- purpose and operation of fire systems:
    - 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:

    - 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:
    - architect
    - lead contractor
    - structural engineer
    - mechanical engineer
    - hydraulic engineer
    - electrical engineer
    - civil engineer
    - fire engineer
    - building (private) certifier
- onsite issues that can arise during the construction phase and impose changes to the designs of fire systems and other services
- installation methods:
    - access requirements
    - work health and safety (WHS) requirements
- hydraulic calculations and fluid mechanics and hydraulics relating to pipe range
- water and oil capture and onsite storage systems for environmental purposes
- sustainability requirements and ratings
    - energy conservation
    - water conservation
- pipe fabrication methods and constraints
- foam suppression systems for a range of types of sites, including:
    - transformers
    - aircraft hangers
    - petroleum industry storage facilities
    - diesel, steam and gas turbine rooms
- commissioning of foam suppression systems:
    - pressure testing methodologies during the installation phases and their advantages and disadvantages:
        - use of water
        - use of compressed air
        - nitrogen cylinders
    - validating water supplies
    - validating tank in-fill flows
    - validating pump performance:
        - setting pressures for pump starts
        - setting pressures for jacking pump start/stop
        - setting pressure for pressure maintenance pump start/stop
        - reaction times to pumps starting:
            - high set pressures
            - low set pressures
    - validating sprinkler system performance:

        - Annubar at sprinkler valves or pumps
        - discharge rates and quantities
        - discharge times for various types of sprinkler systems:
            - at alarm valve
            - remote test valve
    - the role of the local fire authorities in commissioning fire systems
    - documentation to be completed and distributed
- technical issues impacting on foam suppression system designs
- mathematic principles, equations and calculation methods:
    - financial calculations, for example to assess cost-effectiveness of fire systems
    - trigonometry, for example to amend dimensions of pipe allowing for fittings
    - flow calculations:
        - 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
        - ColeBrook White equations and/or tables
        - Manning Formula and/or tables
        - AS 2200 Design charts for water supply and sewerage
        - computational fluid dynamics
- principles of organic and inorganic chemistry
- principles of physical sciences:
    - Boyle's law
    - Charles' law
    - Dalton's law
    - Henry's law
- principles of thermodynamics:
    - effects of heat
    - stratification of gases
    - smoke and heat dynamics
- human psychology, especially fire avoidance behaviour
- project drawings and documentation:
    - architectural
    - structural
    - mechanical
    - electrical
    - hydraulic
    - fire engineer's or estimator's specifications.

Assessment Conditions

Assessors must meet the requirements for assessors contained in the Standards for Registered Training Organisations.

This unit must be assessed in the workplace or a close simulation using realistic workplace conditions, materials, activities, responsibilities, procedures, safety requirements and environmental considerations.

Links

Companion Volume Implementation Guide:
https://vetnet.education.gov.au/Pages/TrainingDocs.aspx?q=7e15fa6a-68b8-4097-b099-030a5569b1ad