Australian Government

CPCPPS5032A Design siphonic stormwater drainage systems

Release 1

INDUSTRY SKILLS COUNCILS
Creating Australia's Future

CPCPPS5032A Design siphonic stormwater drainage systems

Modification History

Changes to performance criteria, required skills and knowledge, range statement and critical aspects
Not equivalent to CPCPPS5012A

Unit Descriptor

This unit of competency specifies the outcomes required to design siphonic stormwater drainage systems, determine installation details, and prepare specifications for a range of residential, commercial and industrial buildings.

Application of the Unit

This unit of competency supports development of skills and knowledge required for competent workplace performance in a consultancy or supervisory capacity in relation to plumbing services and hydraulics.

Licensing/Regulatory Information

In some jurisdictions, this unit of competency may form part of accreditation, licensing, legislative, regulatory or certification requirements.

Pre-Requisites

Nil

Employability Skills Information

This unit contains employability skills.

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 required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1	**Evaluate design parameters.**	1.1	***Scope of work*** is established for siphonic stormwater drainage systems.
		1.2	***Design requirements*** are determined from relevant Australian standards, codes, plans, specifications and client brief.
		1.3	***Siphonic system attributes*** are evaluated and ***cost-benefit analysis*** is conducted, comparing a range of pipe materials and system designs.
		1.4	***Statutory and regulatory requirements and relevant Australian standards and codes*** for the design of siphonic stormwater drainage systems are analysed and applied.
		1.5	Stormwater design manuals, ***manufacturer requirements*** and trade and technical manuals are interpreted.
		1.6	Additional research, including a ***desktop study***, is conducted to outline design parameters.
		1.7	Factors that contribute to quality, safety and time efficiency are determined.
		1.8	***Performance requirements*** are established, considering safety of system users or building occupants.
2	**Plan and detail system components.**	2.1	Siphonic stormwater drainage systems are integrated with the building structure.
		2.2	Volume of roof water and stormwater is calculated using a range of approved methods.
		2.3	***Layout of pipework systems***, and type and location of ***fittings*** are planned.
		2.4	***Pipe size and flow requirements are calculated*** for a range of applications according to stormwater collection requirements.
		2.5	***Pipe supports*** are designed for a range of applications.
		2.6	Approved ***materials and components***, ***jointing methods***

and ***installation requirements*** for siphonic stormwater drainage systems are specified.

3	**Design and size systems.**	3.1	Siphonic stormwater drainage systems are designed for a range of applications.
		3.2	Catchment areas are calculated, collection points determined, and siphonic systems sized.
		3.3	Siphonic stormwater drainage systems are designed and sized using calculations and ***computer software packages***.
		3.4	***Sustainability principles and concepts*** are applied throughout the design process.
4	**Prepare documentation.**	4.1	Client brief of the desired design is prepared.
		4.2	***Plans*** and ***specification*** are prepared for a range of siphonic stormwater drainage systems.
		4.3	***Testing*** and ***commissioning schedule*** is prepared.
		4.4	***Operation and maintenance manual*** is produced, including information on how to properly and safely maintain the system.

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to:
  - communicate with others to ensure safe and effective work practices
  - confirm job specifications and client requirements
  - enable clear and direct communication, using questioning to identify and confirm requirements, share information, listen and understand
  - use language and concepts appropriate to cultural differences
  - use and interpret non-verbal communication, such as hand signals
- initiative and enterprise skills to develop creative and responsive approaches
- literacy skills to:
  - prepare documentation, including:
    - operation and maintenance manual
    - plans, specifications and schedules
  - read and interpret:
    - plans, specifications, drawings and design briefs
    - standards and manufacturer requirements and manuals
    - statutory and regulatory requirements
- numeracy skills to:
  - apply measurements and calculations
  - interpret data
- planning and organising skills to:
  - research, collect, organise and understand information relating to the design of siphonic stormwater systems
  - take initiative and make decisions
- problem-solving skills to analyse requirements, consider options and design an appropriate system
- teamwork skills to work with others to action tasks and relate to people from a range of cultural and ethnic backgrounds and with varying physical and mental abilities
- technical skills to:
  - determine installation details for siphonic stormwater drainage systems
  - prepare specifications for siphonic stormwater drainage systems
- technology skills to:
  - access and understand site-specific instructions in a variety of media
  - use mobile communication technology

Required knowledge

- common terminology and definitions used in design of siphonic stormwater drainage systems for residential, commercial and industrial buildings
- drafting principles
- nature of materials used and effects of performance under various conditions
- procedures for estimating volume of stormwater run-off from rainwater collection areas
- principles of technology in the design of siphonic stormwater drainage systems
- requirements of state regulatory authorities, Australian standards and manufacturer specifications, including hazards identified in relation to devices and systems used
- work health and safety (WHS) requirements, including relevant statutory regulations, codes and standards

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 providing that simulated or project-based assessment techniques fully replicate plumbing and services workplace conditions, materials, activities, responsibilities and procedures.

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 as a minimum provide evidence of the ability to:

- design, size and document the layout details, including a specification of a siphonic system for a site incorporating a high-rise mixed development building and a wide span project (such as a school) to include:
  - applying sustainability principles and concepts throughout
  - evaluating and documenting design parameters to relevant Australian standards, codes and manufacturer requirements for a range of siphonic stormwater drainage systems
  - evaluating health risks associated with the siphonic system
  - designing and sizing siphonic stormwater drainage systems using appropriate calculations and computer software
  - selecting materials and components for compliance, fit for purpose, durability, compatibility and cost-effectiveness
  - preparing testing and commissioning schedules
  - producing operation and maintenance manuals
  - communicating with others to ensure safe and effective workplace operations.

Context of and specific resources for assessment

This competency is to be assessed using standard and authorised work practices, safety requirements and environmental constraints.

Assessment of essential underpinning knowledge will usually be conducted in an off-site context.

Assessment is to comply with relevant regulatory or Australian standards' requirements.

Resource implications for assessment include:

- an induction procedure and requirement
- realistic tasks or simulated tasks covering the minimum task requirements
- relevant specifications and work instructions, including design brief drawings, specifications, codes, design concepts and construction schedules
- tools and equipment appropriate to applying safe work practices, including computers, software and calculators
- workplace instructions relating to safe working practices and addressing hazards and emergencies
- material safety data sheets
- research resources, including industry-related systems information.

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.

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.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and

the practical requirements of the workplace

- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice, with a decision on competency only taken at the point when the assessor has complete confidence in the person's demonstrated ability and applied knowledge
- all assessment that is part of a structured learning experience must include a combination of direct, indirect and supplementary evidence.

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.

Supplementary evidence of competency may be obtained from relevant authenticated documentation from third parties, such as existing supervisors, team leaders or specialist training staff.

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.

Scope of work must include:

- calculation of rainfall intensities in given catchment areas, including:
  - average rainfall intervals
  - meteorological information
  - rainfall intensities
  - stormwater collection area calculations
  - time and concentration
- interpretation of plans and specifications
- sizing and documenting layout of siphonic stormwater drainage systems for residential, commercial and industrial applications and for

	either new projects or an existing structure being renovated, extended, restored or maintained.
Design requirements must include:	• owner requirements • architectural plans • building specifications • pipework identification • catchment area • approved point of discharge • acoustic performance.
Siphonic system attributes must include:	• availability • cost • installation requirements • risks • site conditions.

Cost-benefit analysis:	• compares range of suitable materials and system choices available to enable cost-effective choices to be made without compromising integrity of project
	• must include:
	  • design styles
	  • expected design life
	  • labour costs
	  • material costs
	  • safety factors
	  • speed of installation.

Statutory and regulatory requirements and relevant Australian standards and codes may include:	• AS/NZS3500 National plumbing and drainage • AS2200 Design charts for water supply and sewerage • commonwealth, state or territory requirements and local governments requirements • National Construction Code • other relevant Australian standards and codes.
Manufacturer requirements may include:	• material specifications • sizing tables

- technical and trade manuals
- special siphonic drainage collection inlets.

Desktop study may include collection and interpretation of existing data for design purposes in:

- architectural and building plans
- manufacturer data
- developer plans
- other documents, including:
  - applications
  - brochures
  - forms
  - policies
  - other reports as available.

Performance requirements may include:

- pipe flow velocities, flow conditions and discharge requirements, established using relevant Australian standards, codes and local authorities' requirements.

Layout of pipework systems:

- must include:
  - acoustic performance
  - amenity of the building
  - clipping and pipe support
  - fireproofing
  - function of the building
  - impingement on floor heights
  - location of pipework (fire rating of enclosure)
  - materials to be used
  - size of penetrations
  - type of building structure
- should not unduly affect building integrity and aesthetic appeal
- should have principles of economy, serviceability, durability and fit for use applied.

Fittings may include:

- bends
- junctions.

Pipe size and flow requirement

- discharge

calculations may include:

- flow
- manufacturers' tables
- sizing, according to relevant Australian standards and codes
- velocity
- volumes.

Pipe supports may include:

- anchors
- bracket spacing
- corrosion protection
- cover
- hanging brackets
- material requirements
- saddles
- wall and ceiling brackets.

Materials and components may include:

- appropriate materials specified, based on fit for purpose, durability, compatibility and cost-effectiveness, including:
  - copper (Cu)
  - polyethylene (PE)
  - polypropylene (PP)
  - stainless steel
  - other approved material
- components, may include:
  - clips
  - fasteners
  - fittings
  - pipework
  - siphonic collection inlets.

Jointing methods may include:

- brazing
- electrofusion welding
- mechanical joints
- rubber ring
- other approved jointing methods.

Installation requirements must include:

- pipe protection, which may include:
  - corrosion

- impact
- fire rating
- level of workmanship
- manufacturer-recommended specific fixings
- pipe support
- provision for expansion
- serviceability and access.

Computer software packages may include:

- manufacturer software
- proprietary design software.

Sustainability principles and concepts:

- cover the current and future social, economic and environmental use of resources
- may include:
  - selecting appropriate material to ensure minimal environmental impact
  - efficient use of material
  - efficient energy usage/capital outlay comparison
  - effect on the environment due to overflow or leakage
  - consideration of the Green Building Council of Australia rating scheme.

Plans:

- may include:
  - axonometrics
  - elevations
  - details
  - cross-sections
  - isometrics
  - schematics
  - sections
- may be produced using:
  - computer generation
  - drawing equipment.

Specification may include:

- commissioning
- bedding
- support

- jointing
- manufacturer requirements
- materials
- testing
- workmanship
- work health and safety (WHS).

Testing may include:

- hydrostatic test
- inspection
- performance
- quality assurance (QA) audit.

Commissioning schedule may include:

- system certification
- checking for foreign material
- checking leaks
- cleaning grates
- system defects
- system functions as per design.

Operation and maintenance manual may include:

- as installed drawings
- certification documentation
- results of commissioning test
- maintenance schedules
- manufacturer brochures and technical information
- check for blockages
- leak detection
- regular inspection
- regular maintenance requirements.

Unit Sector(s)

Functional area

Unit sector Plumbing and services

Custom Content Section

Not applicable.