



Australian Government

CPCPPS5026A Design rainwater collection, storage, distribution and re-use systems

Release 1

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Modification History

Changes to unit descriptor, performance criteria, required skills and knowledge, range statement and critical aspects

Not equivalent to CPCPPS5006A

Unit Descriptor

This unit of competency specifies the outcomes required to design systems for the collection, storage, distribution and re-use of rainwater for drinking and non-drinking uses, including irrigation, toilet flushing and other uses approved by relevant authorities.

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 the design of systems for the collection, storage, distribution and re-use of rainwater.

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. | <p>1.1 <i>Scope of work</i> is established for rainwater harvesting systems for wide span and high-rise building projects.</p> <p>1.2 <i>Design requirements</i> are determined from relevant Australian standards, codes, plans, specifications and client brief.</p> <p>1.3 Potential <i>contamination</i> sources are analysed and solutions are applied.</p> <p>1.4 Rainfall patterns and required rainwater storage volumes are established.</p> <p>1.5 <i>Cost-benefit analysis</i> is conducted comparing a range of pipe materials and system designs.</p> <p>1.6 <i>Statutory, regulatory requirements and relevant Australian standards and codes</i> for the design of rainwater harvesting systems are interpreted, analysed and applied.</p> <p>1.7 <i>Manufacturer requirements</i> and trade and technical manuals are interpreted.</p> <p>1.8 Additional research, including a <i>desktop study</i>, is conducted to outline design parameters.</p> <p>1.9 <i>Performance requirements</i> are established, considering safety of system users or building occupants.</p> |
| 2 | Plan and detail system | <p>2.1 <i>Tank type and location</i> are specified.</p> <p>2.2 <i>Layout of pipework systems</i> and type and location of</p> |

- components.** *fittings, valves and controls* are planned.
- 2.3 *First-flush systems* are designed and detailed.
- 2.4 *Filtration systems* and *water contamination solutions* are specified.
- 2.5 *Pipe size calculations* are completed for a range of applications.
- 2.6 Separation of services and backflow prevention devices are designed and detailed.
- 2.7 Approved non-contaminating *materials* and *jointing methods* for rainwater harvesting are specified and *pipe supports* are designed.
- 2.8 *Pump and ancillary requirements* are sized and detailed.
- 2.9 *Installation requirements* are specified.
- 2.10 Water treatment is specified according to state and territory health requirements.
- 2.11 Vermin protection is specified according to manufacturer and state and territory requirements.
- 2.12 Allowance for expansion and contraction is provided.
- 3 Design and size systems.**
- 3.1 Rainwater harvesting systems are designed and detailed for a range of residential, commercial and industrial applications.
- 3.2 *Rainwater reuse systems* are designed and detailed.
- 3.3 Rainwater harvesting systems are designed and sized using calculation 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 *specifications* are prepared for a range of rainwater harvesting 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
- 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
- initiative and enterprise skills to develop creative and responsive approaches
- numeracy skills to apply measurements and calculations
- planning and organising skills to:
 - research, collect, organise and understand information relating to the design of rainwater collection, storage, distribution and re-use 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 design systems for the collection, storage, distribution and reuse of rainwater for drinking and non-drinking uses
- 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 the design of rainwater collection, storage,

distribution and re-use

- key features of work plans and specifications
- nature of materials used and effects of performance under various conditions
- organisational quality procedures and processes
- principles of technology in the design of rainwater collection, storage, distribution and reuse for residential, commercial and industrial applications to include water treatment and backflow protection of drinking and non-drinking water supply systems
- relevant Australian standards, codes, manufacturer specifications, National Construction Code and operating procedures relevant to the sector
- terminology and definitions used in hydraulic design
- 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 for a high-rise mixed development building and a wide span project, such as a school or industrial complex.
- evaluate and document design parameters, including rainfall, client, regulatory, manufacturer and relevant Australian standard requirements and storage capacity for a range of rainwater harvesting systems
- plan and detail system components, including:
 - authority connection
 - backflow prevention requirements
 - filters
 - fixtures and fitments
 - piping systems
 - pumps
 - storage
 - water treatment
- design and size rainwater harvesting and reuse systems
- prepare plans and specifications for a range of rainwater harvesting and reuse systems to industry standards
- prepare testing and commissioning schedules
- prepare operation and maintenance manuals
- apply sustainability principles and concepts throughout the design to achieve a green star rating
- communicate 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:
 - interpreting plans and specifications
 - rainfall analysis
 - sizing and documenting layout of rainwater harvesting systems for residential, commercial and industrial applications to include water treatment and backflow protection of drinking

and non-drinking water supply systems

- may be for new projects or an existing structure being renovated, extended, restored or maintained.

Design requirements must include:

- architectural plans
- building specifications
- owner requirements
- pipework identification
- sizing of pipework
- backflow protection of drinking and non-drinking water supply systems
- water treatment
- specialist water use applications.

Contamination may include:

- bacterial
- heavy metal
- inorganic
- odour
- organic
- taste
- silt
- viral
- vermin.

Cost-benefit analysis:

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

Statutory, regulatory requirements and relevant Australian standards

- Acts and regulations, commonwealth, state or territory and local government requirements
- AS/NZS3500 National plumbing and drainage

and codes include:

- AS2200 Design charts for water supply and sewerage
- National Construction Code.

Manufacturer requirements may include:

- material specifications
- pipe sizing
- pump installation
- storage system
- technical and trade manuals
- other relevant documents.

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

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

Performance requirements must include:

- compliance limits for:
 - bacteria levels
 - nutrients
 - pH
 - silt control
 - vermin protection
 - overflow discharge requirements
- requirements established using relevant Australian standards, codes and local authority plans, including:
 - cover
 - discharge
 - flow conditions
 - pipe grades.

Tank type and location may include:

- tank type:
 - concrete
 - fibreglass

- metal
- polymer
- other approved materials
- tank location may include:
 - above-ground
 - in-ground.

Layout of pipework systems:

- may include:
 - gravity systems
 - pumped systems
- should not unduly affect building integrity and aesthetic appeal
- should have principles of economy, serviceability, durability and fit for use.

Fittings, valves and controls
include:

- backflow prevention devices
- inspection openings
- irrigation control systems
- isolating valves
- level indicators
- pump controls.

First-flush systems may include:

- electronic
- float-activated
- mechanical
- volume-activated.

Filtration systems may include:

- overflow devices
- sand
- screens
- settlement tanks
- strainers.

Water contamination solutions may
include:

- disinfection
- ultraviolet.

Pipe size calculations must include:

- determination of flow
- interpretation of design charts and tables

- pipe sizing calculations
- reduced level calculations.

Materials may include:

- copper (Cu)
- polyethylene (PE)
- polypropylene (PP)
- polybutylene (PB)
- unplasticised polyvinyl chloride (PVC-U)
- other approved material.

Jointing methods may include:

- brazing
- compression joints
- electrofusion welding
- mechanical joints
- solvent cement
- threading
- other approved jointing methods.

Pipe supports may include:

- anchors
- bedding
- bracket spacing
- concrete support
- corrosion protection
- manufacturer-recommended specific fixings
- material requirements
- provision for expansion
- saddles.

Pump and ancillary requirements may include:

- automatic controls
- pump duties
- corrosion-resistant materials
- level controls and alarms
- pump selection and pump sizing, based on:
 - flow
 - velocity
 - lift
 - probable simultaneous demands.

Installation requirements may include:

- pipe protection, which may include:
 - cover
 - corrosion
 - impact
- fire rating
- level of workmanship
- manufacturer-recommended specific fixings
- pipe support
- provision for expansion
- serviceability and access.

Rainwater reuse systems must include:

- roof water collection
- storage may include:
 - tanks
 - open in-ground (dam)
- water treatment
- pumps
- approved drinking and non-drinking use.

Sustainability principles and concepts:

- cover the current and future social, economic and environmental use of resources
- may include:
 - efficient use of material
 - efficient energy use/capital outlay comparison
 - water use
 - evaporation
 - local environment consideration
 - overflow disposal/reuse
 - consideration of the Green Building Council of Australia rating scheme
 - selecting appropriate components to ensure minimal environmental impact.

Plans:

- may include:
 - axonometrics
 - cross-sections
 - details
 - elevations
 - isometrics

- schematics
- may be produced using:
 - computer generation
 - drawing equipment.

Specification may include:

- backflow prevention
- flow requirements
- jointing
- manufacturer requirements
- materials
- residual pressures
- safety (WHS)
- specialised components
- storage
- support
- testing
- valve selection
- water treatment
- workmanship.

Testing must include:

- air pressure
- backflow protection
- defect inspection
- drainage inspection
- hydrostatic
- performance:
 - flow
 - pressure
- water quality
- quality assurance (QA) audit.

Commissioning schedule must include:

- balancing disposal system
- flow and pressure adjustments
- leak check
- pressure test
- pump settings
- safety requirements
- system certification
- system defects
- system flushing

- system functions as per design
- system purge
- valve operation
- ventilation
- vermin control.

Operation and maintenance manual may include:

- as installed drawings
- certification documentation
- maintenance schedules
- manufacturer brochures
- ongoing maintenance requirements
- pump maintenance
- regular inspections
- results of commissioning test
- safety management system
- system detail, setting and operations
- valve function
- system operational parameter adjustments and checks, including:
 - disinfection
 - first flush devices
 - pH
 - silt control
 - suspended solids
 - water quality.

Unit Sector(s)

Functional area

Unit sector Plumbing and services

Custom Content Section

Not applicable.