



Australian Government

Department of Education, Employment and Workplace Relations

CPCPPS5006A Design rainwater collection, storage, distribution and re-use systems

Release: 1

CPCPPS5006A Design rainwater collection, storage, distribution and re-use systems

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit of competency specifies the outcomes required to design systems for the collection, storage, distribution and re-use of rainwater for potable and non-potable uses, including irrigation, toilet flushing and other uses as defined by local authorities.
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Application of the Unit

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.
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Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units	Nil
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Employability Skills Information

Employability skills 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 performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Evaluate design parameters.	1.1. Scope of work is established for rainwater harvesting systems for wide span and high-rise building projects. 1.2. Design requirements are determined from plans, specifications and client briefs. 1.3. Potential contamination sources are analysed and solutions are applied. 1.4. Monthly and annual rainfall patterns and required rainwater storage volumes are established. 1.5. Cost-benefit analysis is conducted comparing a range of pipe materials and system designs. 1.6. Statutory, regulatory requirements and Australian and New Zealand standards for the design of rainwater harvesting systems are interpreted, analysed and applied. 1.7. Manufacturer requirements and trade and technical manuals are interpreted. 1.8. Additional research, including a desktop study, is conducted to outline design parameters. 1.9. Performance requirements are established.
2. Plan and detail system components.	2.1. Tank type and location are specified. 2.2. Layout of pipework systems and type and location of fittings and valves are planned. 2.3. First-flush systems are designed and detailed. 2.4. Strainers and water contamination solutions are specified. 2.5. Pipe size and pipe grade calculations are completed and pipe fixings are designed 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. 2.8. Pump and pump control requirements are sized and detailed. 2.9. Installation requirements are specified.
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 re-use systems are designed and detailed. 3.3. Rainwater harvesting systems are designed and sized using computer software packages.
4. Prepare	4.1. Plans are prepared for a range of rainwater

ELEMENT	PERFORMANCE CRITERIA
documentation.	harvesting systems. 4.2. Specification for a rainwater harvesting system is prepared. 4.3. Testing and commissioning schedule is prepared. 4.4. Operation and maintenance manual is produced.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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

Required skills

Required skills for this unit are:

- 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
 - read and interpret:
 - plans, specifications, drawings and design briefs
 - standards and manufacturer requirements and manuals
 - statutory and regulatory requirements
 - use language and concepts appropriate to cultural differences
 - use and interpret non-verbal communication, such as hand signals
- written skills to prepare documentation, including:
 - operation and maintenance manual
 - plans, specifications and schedules
- designing systems for the collection, storage, distribution and re-use of rainwater for potable and non-potable uses
- innovation skills to develop creative and responsive approaches
- numeracy skills to apply measurements and calculations
- planning and organisational 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

REQUIRED SKILLS AND KNOWLEDGE

range of cultural and ethnic backgrounds and with varying physical and mental abilities.

Required knowledge

Required knowledge for this unit is:

- common terminology and definitions used in the design of rainwater collection, storage, distribution and re-use
- nature of materials used and effects of performance under various conditions
- principles of technology in the design of rainwater collection, storage, distribution and re-use for all classes of building
- requirements of state regulatory authorities, Australian standards and manufacturer specifications, including hazards identified in relation to devices and systems used according to:
 - AS/NZS1546 On-site domestic wastewater treatment units
 - AS/NZS1547 On-site domestic wastewater management
 - AS/NZS3500 National plumbing and drainage set
 - AS2200 Design charts for water supply and sewerage
 - other standards, codes or standard operating procedures
- workplace safety requirements, including relevant statutory regulations, codes and standards.

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, 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 provide evidence of:

- evaluating and documenting design parameters, including rainfall, client, regulatory, manufacturer and Australian and New Zealand standard requirements and storage capacity for a range of rainwater harvesting systems
- planning and detailing system components, including:
 - filters
 - piping systems
 - pumps
 - strainers
- designing and sizing rainwater harvesting systems
- designing and sizing rainwater re-use systems
- preparing plans for a range of rainwater harvesting and re-use systems to industry standards
- preparing specifications for rainwater harvesting and re-use systems
- preparing testing and commissioning schedules
- preparing operation and maintenance manuals.

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.

EVIDENCE GUIDE

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

EVIDENCE GUIDE

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

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:

- includes:
 - interpretation of plans and specifications
 - rainfall analysis
 - sizing and documenting layout of rainwater harvesting systems for applications, including residential, commercial and

RANGE STATEMENT

industrial

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

RANGE STATEMENT

<i>Design requirements</i> include:	• architectural specifications • builder specifications • owner requirements • specialist water use applications.
<i>Contamination</i> includes:	• bacterial • heavy metal • inorganic • odour • organic • taste • viral.
<i>Cost-benefit analysis</i> includes:	• comparison of range of suitable materials and system choices available to enable cost-effective choices to be made without compromising integrity of project.
<i>Statutory, regulatory requirements and Australian and New Zealand standards</i> include:	• Acts and regulations • AS/NZS3500 National plumbing and drainage set • AS2200 Design charts for water supply and sewerage • Building Code of Australia • local and state government policies, including group and strata titling.
<i>Manufacturer requirements</i> include:	• material specifications • pump tables • sizing tables • technical and trade manuals.
<i>Desktop study</i> includes collection and interpretation of existing data for design purposes from:	• architectural and building plans • council plans • developer plans • manufacturers' data • other documents, including: • applications • forms • sewer detail maps • other reports as available.
<i>Performance requirements</i> include:	• pipe grades, cover, flow conditions and discharge requirements, established using Australian and New Zealand standards and local authority plans.

RANGE STATEMENT

Tank type and location include:

- tank type:
 - coloured steel
 - concrete
 - fibreglass
 - galvanised steel
 - plastic
 - polyethylene
 - other approved materials
- tank location:
 - above-ground
 - in-ground
 - reduced levels
 - site plan.

Layout of pipework systems:

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

Fittings and valves include:

- backflow prevention devices
- bends
- inspection openings
- isolating valves
- junctions.

First-flush systems include:

- electronic
- float-activated
- manual
- mechanical
- time-activated
- volume-activated.

Strainers include:

- downpipe
- gutter
- point of use
- pump inlet
- pump outlet
- tank inlet
- tank outlet

RANGE STATEMENT

- tap.

RANGE STATEMENT

Water contamination solutions
include:

- chlorination
- disinfection
- filters
- ozone
- reverse osmosis
- screens
- strainers
- ultraviolet.

Pipe size and pipe grade calculations include:

- determination of flow
- gradient calculations
- interpretation of design charts and tables
- pipe sizing calculations
- reduced level calculations.

Pipe fixings include:

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

Materials include:

- concrete
- copper
- fittings and fixtures
- high density polyethylene (HDPE)
- low density polyethylene (LDPE)
- unplasticised polyvinyl chloride (PVC-U).

Jointing methods include:

- brazing
- compression
- gluing
- mechanical joints
- solvent cement
- threading
- welding.

Pump and pump control requirements include:

- automatic controls
- capacity
- corrosion-resistant materials
- detailing

RANGE STATEMENT

- high and low-level water controls and alarms
- impeller sizing
- inlet and outlet design
- installation
- mounting
- pump selection and pump sizing, which is based on:
 - flow
 - velocity
 - lift
 - pressure requirements
- valve
- warning system.

RANGE STATEMENT

Installation requirements include:

- bedding
- clipping
- concrete support
- independent anchoring of above-ground and in-ground tanks
- installation details
- jointing
- level of workmanship.

Rainwater re-use systems include:

- irrigation applications
- laundry applications
- potable re-use
- toilet flushing
- wash-down applications.

Plans include:

- axonometrics
- cross-sections
- details
- elevations
- isometrics
- schematics, which may be produced using:
 - pencil
 - Indian ink
 - pigment liner
 - computer generation
- sections.

Specification includes:

- bedding
- clipping
- concrete support
- detailing specialised components
- jointing
- manufacturer requirements
- materials
- workmanship.

Testing includes:

- air pressure test
- hydrostatic test
- quality assurance (QA) audit.

Commissioning schedule includes:

- flow adjustments
- flushing system
- leak check
- pressure testing

RANGE STATEMENT

Operation and maintenance manual includes:

- pump adjustments
- water filling in-ground tanks.
- cleaning filters and strainers
- disinfection of storage tanks
- leak detection
- pump maintenance
- regular maintenance requirements
- water auditing
- yearly inspections.

Unit Sector(s)

Unit sector Plumbing and services

Co-requisite units

Co-requisite units Nil

Functional area

Functional area