Australian Government

Department of Education, Employment and Workplace Relations

CPCPCM5002B Design complex stormwater and roof drainage systems

Release: 1

CPCPCM5002B Design complex stormwater and roof drainage systems

Modification History

Not Applicable

Unit Descriptor

Unit descriptor This unit of competency specifies the outcomes required to design complex stormwater and roof drainage systems for commercial, industrial and residential properties.

Application of the Unit

Application of the unit This unit of competency supports the needs of experienced plumbers specialising in hydraulics.

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units Nil

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. ***Client*** requirements are determined from plans, specifications and client briefs.
	1.2. Local government, Environment Protection Authority (EPA), and Australian and New Zealand standards for the design of complex stormwater and roof drainage systems are interpreted.
	1.3. Regulatory requirements for design of complex stormwater and roof drainage systems are analysed and applied.
	1.4. Other documentation relevant to the design is researched, evaluated and applied.
2. Plan system components.	2.1. Layout of ***system components*** is planned according to design parameters and site limitations, and is coordinated with other services.
	2.2. Stormwater diversion valve systems and first-flush stormwater systems are planned and evaluated.
	2.3. Most suitable methods of preventing backflow of sub-soil and stormwater into buildings are determined and specified.
	2.4. Treatment and disposal options for stormwater discharge are evaluated and planned.
3. Design and size systems.	3.1. ***Rainfall intensities are determined*** and volumes of water are estimated using measurements of different ***catchment areas***.
	3.2. Methods of collection and disposal of surface run-off water are specified.
	3.3. Strategies for harvesting and re-using rainwater are identified and evaluated.
	3.4. Sub-soil water types are determined and ***stormwater drainage systems*** are designed, sized and detailed using appropriate software applications.
	3.5. System components are selected, designed, sized and detailed using appropriate software applications and appropriate ***approved materials*** are analysed and selected.
	3.6. ***Stormwater systems requiring pumping*** are identified and designed using appropriate software applications, with pump and discharge pipe sizes calculated and specified.
	3.7. Correct installation, laying and jointing procedures for materials and components are specified.

ELEMENT	PERFORMANCE CRITERIA
4. Prepare documentation.	4.1. ***Plans*** are prepared for a range of complex stormwater and roof drainage systems. 4.2. ***Specification*** for a complex stormwater and roof drainage 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:

- ability to apply design concepts and principles
- communication of graphical representations and plans
- communication skills to:
  - 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
- innovation skills to develop creative and responsive approaches
- identifying and accurately reporting to appropriate personnel any faults in tools, equipment or materials
- numeracy skills to apply measurements and calculations
- planning and organisational skills to:
  - research, collect, organise and understand information relating to the design of complex stormwater and roof drainage systems
  - take initiative and make decisions
- problem solving skills to analyse requirements, consider options and design an appropriate system
- reading and interpretation skills to interpret:
  - charts and hand drawings
  - job drawings
  - manufacturer specifications and instructions
  - material safety data sheets
  - memos

REQUIRED SKILLS AND KNOWLEDGE

- organisational work specifications
- regulatory requirements
- requirements and instructions issued by authorised organisational or external personnel
- signage
- work bulletins
- work schedules and plans
- technological skills to:
  - access and understand site-specific instructions in a variety of media
  - use mobile communication technology.

Required knowledge

Required knowledge for this unit is:

- relevant Australian and New Zealand standards, including:
  - AS/NZS3500 National plumbing and drainage set
  - Building Code of Australia
  - manufacturer specifications
  - other applicable codes or standard operating procedures relevant to the sector
- terminology and definitions used in hydraulic design
- installation methods used in hydraulic systems
- hazards associated with devices and systems used in the hydraulic sector
- environmental requirements, including:
  - clean-up protection
  - stormwater protection
  - waste management
  - water quality management
- quality assurance requirements, including:
  - EPA
  - internal company quality assurance policy and risk management strategies
  - International Standards Organisation
  - site safety plan
  - workplace operations and procedures
- regulatory and legislative requirements, particularly those pertaining to:
  - building codes
  - OHS and environmental requirements
  - plumbing regulations
  - safe work procedures relating to planning, sizing and documenting layout of pipework and fixtures.

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.

It may be assessed on its own or as part of an integrated assessment activity involving production of designs, plans, specifications and supporting documentation for a complex stormwater and roof drainage system.

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:

- collecting, analysing and evaluating research, including:
  - survey plans
  - existing services
  - building plans
  - site plans
  - civil drawings
  - reduced levels
  - contour levels
- preparing a plan coordinated with other services for the layout of piping, pits, gullies and other system components in accordance with design parameters and site limitations
- calculating stormwater detention basins' sizes and capacities
- calculating roof catchment areas and surface run-off volumes
- determining specifications for guttering requirements and size of downpipes
- designing sub-soil drainage systems, including sizing for collection, containment and discharge

- creating detail drawings, including long sections and cross-sections
- creating a design, including size and detail for complex stormwater and roof drainage systems, including:
  - grade of drains
  - holding pits
  - collection sumps
  - detention basins
  - manholes
  - other system components
- applying appropriate software in order to design, size and detail selected stormwater systems
- preparing plans for a range of complex stormwater and roof drainage systems
- preparing a specification for a complex stormwater and roof drainage system
- preparing a testing and commissioning schedule
- preparing an operation and maintenance manual.

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
- tools and equipment appropriate to applying safe work practices
- support materials appropriate to activity
- 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

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.

Clients may include:

- architects
- builders
- property owners
- statutory bodies.

Local government, ***Environment Protection Authority***, ***and Australian and New Zealand standards requirements*** cover:

- local government requirements, including:
  - Integrated Planning Act (IPA)
  - other regulatory requirements
  - standard drawings and details
  - town planning requirements
  - urban design manuals
- treatment requirements, such as:
  - screens
  - silt traps
  - solid removal systems
- environmental requirements to cover water quality management, including:
  - clean-up protection
  - stormwater protection
  - waste management
- Australian and New Zealand standards, including:
  - AS/NZS3500 National plumbing and drainage set:
    - Part 3.1 Stormwater drainage -

RANGE STATEMENT

	performance criteria • Part 3.2 Stormwater drainage - acceptable solutions • AS2200 Design charts for water supply and sewerage.
Other documentation relevant to the design includes plans, drawings, manuals and reports regarding:	• buildings • civil drawings • contour levels • existing services • manufacturer requirements and specifications • reduced levels • site plans • stormwater design • surveys.
System components include:	• access chambers • channels • culverts • downpipes • grated pits • gullies • guttering • inspection chambers • inspection openings • kerbs • manholes • piping • pits.

Treatment and disposal options for stormwater discharge include:	• treatment options:
	  • grass and rock swales
	  • lagoons
	  • momentum diffusers
	  • ponds
	  • screens
	  • silt traps
	  • traps
	  • other solid removal systems as determined
	• disposal options:
	  • connection to stormwater mains
	  • creeks

RANGE STATEMENT

	• kerb and street channels • lakes • manholes • rainwater collection systems, including tanks and dams • rivers • streams.
Rainfall intensities are determined by:	• average rainfall intervals • roof, surface and subsurface calculations • time and concentration.
Catchment areas include:	• land surface catchment areas, including a variety of surface conditions such as grassed and paved areas • roof catchment areas.
Stormwater drainage systems include:	• collection sumps • detention basins • grade of drains • holding pits • manholes.

Approved materials include:	• piping materials:
	  • concrete
	  • earthenware
	  • fibre cement (FRC)
	  • polyvinyl chloride (PVC)
	  • other composite materials
	• fittings:
	  • bends
	  • grates
	  • gullies
	  • junctions
	  • non-return valves.

Stormwater systems requiring pumping include:	• building basements • rising main installations • subsurface water drainage systems.
Plans include:	• cross-sections • detail drawings • long sections.
Specification and user manuals	• commissioning • components

RANGE STATEMENT

include:	• fittings • installation • maintenance • materials • pumps • testing • valves.

Unit Sector(s)

Unit sector Plumbing and services

Co-requisite units

Co-requisite units Nil

Functional area

Functional area