

Unit of Competency CPCPCM5014

Design sewer infrastructure systems

Application

This unit specifies the skills and knowledge required to design and document sewer infrastructure systems for residential development of 50 properties. This includes specifying responsibilities, procedures and safety standards for sewerage equipment, construction, soil classification, pipe laying techniques and trench construction. The unit also covers analysing factors relating to pumping and tunnelling and supervising the installation of a sewer infrastructure system.

This unit covers requirements for competent workplace performance in a consultancy or supervisory capacity in relation to plumbing services and hydraulics.

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

Prerequisite Unit

Nil.

Elements and Performance Criteria

1. Prepare and implement sewer contracts.	1.1 Identify and apply main utility sewer design and sizing procedures. 1.2 Document required qualifications, roles and responsibilities of local authority personnel and contracted parties qualified to install sewers.
2. Plan and detail system components.	2.1 Analyse soil classification, characteristics and types from test results. 2.2 Detail trenching safety procedures, specifying backfilling and compaction methods. 2.3 Plan layout of pipework systems, including the type and location of fittings, valves and controls. 2.4 Specify pipe laying, dewatering and testing procedures for installation of pipework of varying sizes. 2.5 Calculate self-cleaning velocities, pipe size and grade, and ventilation requirements for a range of systems. 2.6 Detail sewer connections, access chambers, bedding material and support systems. 2.7 Determine size and detail requirements for pump station, pumps, controls and equipment. 2.8 Specify approved materials, jointing methods and installation requirements for sewer infrastructure systems. 2.9 Identify maintenance procedures of the system.
3. Evaluate design parameters.	3.1 Establish scope of work for sewer infrastructure systems. 3.2 Determine design requirements from relevant Australian standards, codes, plans, specifications and client brief. 3.3 Conduct cost-benefit analysis comparing a range of pipe materials and system design. 3.4 Analyse and apply statutory and regulatory requirements and relevant

	<p>Australian Standards and codes for the design of sewer infrastructure systems.</p> <p>3.5 Obtain trade and technical manuals and interpret manufacturer requirements.</p> <p>236 Conduct additional research, including a desktop study to outline design parameters.</p> <p>3.7 Determine factors that contribute to quality, safety and time efficiency.</p> <p>3.8 Determine point of connection to the authority's system.</p> <p>3.9 Specify safety procedures and regulations for trench safety and for pumping stations and establish performance requirements.</p> <p>3.10 Assess pipe sizes using equivalent population (EP) density.</p>
4. Design and size systems.	<p>4.1 Identify easements and location for sewer infrastructure systems, including pumping rising mains.</p> <p>4.2 Design sewer infrastructure systems for a range of applications.</p> <p>4.3 Design and detail sewer long sections.</p> <p>4.4 Design pump rising main systems.</p> <p>4.5 Design pumping stations.</p> <p>4.6 Apply computer software packages to design and size sewer infrastructure system.</p> <p>4.7 Determine and design ventilation requirements.</p> <p>4.8 Apply sustainability principles and concepts throughout the design process.</p>
5. Prepare documentation.	<p>5.1 Prepare client brief of the desired design.</p> <p>5.2 Prepare plans and specification for a range of sewer infrastructure systems.</p> <p>5.3 Prepare testing and commissioning schedule.</p> <p>5.4 Produce operation and maintenance manual, including information on how to properly and safely maintain the system.</p>

Foundation skills

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

Unit Mapping Information

Supersedes and is equivalent to CPCPCM5014A Design sewer infrastructure systems.

Links

Companion Volume Implementation Guide:

<https://vetnet.education.gov.au/Pages/TrainingDocs.aspx?q=7e15fa6a-68b8-4097-b099-030a5569b1ad>

Assessment Requirements for CPCPCM5014

Design sewer infrastructure systems

Performance Evidence

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

- designing, sizing and documenting the installation and layout details for a sewer infrastructure system for a residential development of 50 properties, incorporating a gravity system and pumping station, to include:
 - sewer reticulation mains
 - pump station
 - pump rising main
 - ventilation
 - odour control
- evaluating and documenting design parameters to relevant Australian standards and codes, and regulatory, client and manufacturer requirements.

Knowledge Evidence

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

- common terminology and definitions used in the design of sewer infrastructure systems
- application of statutory and regulatory requirements and relevant Australian standards and codes:
 - Acts, regulations and Commonwealth, state or territory and local government policies
 - AS/NZS 3500 National plumbing and drainage
 - AS 2200 Design charts for water supply and sewerage
 - Environmental Protection Authority (EPA)
 - National Construction Code (NCC)
 - Sewerage Code of Australia
 - other relevant Australian standards and codes
 - utility provider's design standards—e.g. Water Corporation (WA), Urban Utilities (QLD)
- scope of work requirements:
 - interpreting plans and specifications
 - sizing and documenting layout sewer infrastructure system
- design requirements:
 - architectural plans
 - builder specifications
 - fire safety requirements
 - owner requirements
 - pipework identification

- o flow requirements and sizing of pipework
 - o ventilation requirements
- cost-benefit analysis comparing the range of suitable materials and system choices available to enable cost-effective choices without compromising the integrity of the project
- nature of materials used and effects of performance under various conditions:
 - o cast iron
 - o concrete
 - o vitrified clay pipes (VCP)
 - o polyethylene (PE)
 - o polypropylene (PP)
 - o unplasticised polyvinyl chloride (uPVC)
 - o other approved materials
- manufacturer requirements:
 - o material specifications
 - o collection and storage systems
 - o design and installation
 - o equipment installation
 - o pump installation
 - o technical manuals
- trench safety procedures:
 - o conditions affecting trench stability
 - o condition of soils disturbed by previous excavations
 - o effect of water on excavations
 - o effects of moisture content on excavated trenches
 - o traffic and vibrations
 - o confined space safety requirements e.g. for exhaust emissions
 - o prevention of trench collapse
 - o trench collapse procedures
 - o trench collapse inspection procedures
 - o trench excavation methods used for different:
 - backfilling methods
 - bedding methods
 - depth
 - slope
 - support systems
 - types
 - o safety procedures with reference to:
 - advisory standards
 - compliance standards
 - industry standards
 - Work Health and Safety Act
 - other acts, codes or regulations relating to trenching
 - working in confined spaces
- layout of pipework systems:
 - o gravity
 - o pumped and rising mains
 - o vacuum
 - o identification of easements and location for sewer infrastructure systems, including pumping rising mains
 - o layout requirements to:

- not unduly affect building integrity and aesthetic appeal
 - apply principles of economy, serviceability, durability and fitness for use
- characteristics and application of different fittings, valves and controls:
 - fittings
 - bends
 - flanges
 - junctions
 - inspection openings
 - unions
 - valves non-return and isolation
 - controls
 - level
 - alarms
 - management communication systems
- pipelaying procedures:
 - cutting, handling and storage procedures
 - fittings used for sewerage work
 - jointing methods and procedures
 - laying procedures for pipework
 - methods of dewatering trenches
 - methods of grading and maintaining pipe direction and reduced levels
 - methods of placing bedding materials, encasing pipes, backfilling and compacting
 - methods of testing sewer drains
 - methods of pressure testing pump rising mains
- processes for calculating pipe size, pipe grade and ventilation requirement:
 - determination of flow and loadings
 - gradient calculations
 - equivalent population (EP) density
 - interpretation of design charts and tables
 - pipe sizing calculations
 - projected flows
 - pumping flow rates
 - reduced level calculations
 - self-cleaning pipe velocities
 - stormwater infiltration
 - system ventilation
- access chamber details:
 - access
 - benching
 - connections
 - covers
 - flow and gradient
 - open and closed channel
 - sizing
- pump station, pumps, controls and equipment requirements:
 - access covers
 - access ladders
 - automatic controls
 - capacity

- o corrosion-resistant materials
 - o emergency storage and power supply
 - o impeller sizing and selection
 - o inlet and outlet design
 - o installation and mounting
 - o odour control
 - o macerator requirements
 - o management communication system
 - o provision for servicing
 - o pump selection
 - o pump well sizing
 - o space requirements
 - o valves
 - o ventilation
 - o warning system
- characteristics and application of different jointing methods
- installation requirements:
 - o bedding
 - o pipe protection
 - cover
 - corrosion
 - impact
 - o level of workmanship
 - o manufacturer-recommended specific fixings
 - o pipe support
 - o provision for pipe movement
 - o serviceability and access
- rising main systems:
 - o approved pressure pipe and fittings
 - o calculated rise and pump delivery requirements
 - o environmental protection
 - o pump sizing to meet calculated flow conditions
 - o self-cleaning pipe velocities
 - o odour control
- the use and limitations of computer software packages including manufacture and proprietary design software
- plans and specifications requirements:
 - o axonometric
 - o cross-sections
 - o details
 - o elevations
 - o isometrics
 - o schematics
 - o site
 - o sections
 - o specifications
 - o bedding
 - o commissioning
 - o excavation requirements
 - o support

- o concrete support and detailing specialised components
 - o jointing
 - o access chambers (manholes)
 - o manufacturer requirements
 - o materials
 - o piping
 - o pumps
 - o pumping stations
 - o WHS
 - o testing
 - o workmanship
- testing methods:
 - o air pressure
 - o drainage inspection
 - o hydrostatic
 - o performance
 - o compliance with authorities' discharge requirements
 - o quality assurance (QA) audit
- commissioning schedule requirements:
 - o system certification
 - o check for foreign material
 - o containment
 - o leak check
 - o operational
 - o pumping
 - o system defects
 - o system functions as per design
 - o ventilation
 - o odour control
 - o WHS compliance
- operation and maintenance manual requirements:
 - o as installed drawings
 - o certification documentation
 - o emergency procedures
 - o results of commissioning test
 - o maintenance schedules
 - o manufacturer brochures and technical information
 - o odour control
 - o WHS requirements
 - o ventilation
- sustainability principles and concepts:
 - o selecting appropriate material to ensure minimal environmental impact
 - o efficient use of material
 - o efficient energy usage/capital outlay comparison
 - o consideration of the Green Building Council of Australia rating scheme
- principles of technology in the design of sewer infrastructure systems.

Assessment Conditions

Assessors must satisfy the requirements for assessors listed 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>