



Australian Government

Department of Education, Employment and Workplace Relations

CPCPPS5013A Design vacuum sewerage systems

Release: 1

CPCPPS5013A Design vacuum sewerage systems

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit of competency specifies the outcomes required to design vacuum sewerage systems, determine installation details, and prepare specifications for a range of residential, commercial and industrial buildings, using proprietary components.
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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 plumbing services and hydraulics.
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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 vacuum sewerage systems for wide span and high-rise building projects. 1.2. Design requirements are determined from plans, specifications and client briefs. 1.3. Vacuum sewerage system attributes are evaluated and a cost-benefit analysis is conducted, comparing a range of pipe materials and system designs. 1.4. Statutory and regulatory requirements and Australian and New Zealand standards for the design of vacuum sewerage systems are analysed and applied. 1.5. 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. Performance requirements are established.
2. Plan and detail system components.	2.1. Layout of pipework systems and type and location of fittings and valves are planned. 2.2. Sewerage loading is calculated using a range of approved methods. 2.3. Pipe size calculations are performed for a range of applications in accordance with regulations and manufacturer requirements. 2.4. Pipe fixings are designed for a range of applications. 2.5. Pumpwell, pump and pump control requirements are sized and detailed. 2.6. Approved materials, jointing methods and installation requirements for vacuum sewerage systems are specified.
3. Design and size systems.	3.1. Vacuum sewerage systems are designed for a range of applications. 3.2. Vacuum sewerage systems are designed and sized using computer software packages.
4. Prepare documentation.	4.1. Plans are prepared for a range of vacuum sewerage systems. 4.2. Specification for a vacuum sewerage 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
- determining installation details for vacuum sewerage systems
- innovation skills to develop creative and responsive approaches
- numeracy skills to:
 - apply measurements and calculations
 - interpret data
- planning and organisational skills to:
 - research, collect, organise and understand information relating to the design of vacuum sewerage systems
 - take initiative and make decisions
- preparing specifications for vacuum sewerage systems
- 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.

Required knowledge

REQUIRED SKILLS AND KNOWLEDGE

Required knowledge for this unit is:

- common terminology and definitions used in design of vacuum sewerage systems for all classes of building
- drafting principles
- nature of materials used and effects of performance under various conditions
- principles of technology in the design of vacuum sewerage systems
- requirements of state regulatory authorities, Australian standards and manufacturer specifications, including hazards identified in relation to devices and systems used
- 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:

- planning and producing an appropriate layout for the vacuum sewerage system in accordance with manufacturer and regulatory requirements
- calculating pipe sizes in accordance with regulations and manufacturer requirements
- designing and sizing vacuum sewerage systems using appropriate software
- selecting materials and components for compliance, fit for purpose, durability, compatibility and cost-effectiveness
- preparing plans for a range of vacuum sewerage systems
- preparing design specification for vacuum sewerage systems
- preparing a testing and commissioning schedule
- producing 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:

EVIDENCE GUIDE

- 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

EVIDENCE GUIDE

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, and sizing and documenting layout of vacuum sewerage systems, for residential, commercial and industrial applications, for either new projects or an existing structure being renovated, extended, restored or maintained.

Design requirements include:

- architectural specifications
- builder specifications
- owner requirements

RANGE STATEMENT

Vacuum sewerage system attributes include:

- specialist water use applications.
- availability
- cost
- installation requirements
- risks
- sewerage loading
- site conditions.

Cost-benefit analysis includes:

- comparison of range of suitable materials and system choices available to enable cost-effective choices to be made without compromising integrity of project.

Statutory and regulatory requirements and Australian and New Zealand standards include:

- Acts, regulations and local and state government policies, including group and strata titling
- AS/NZS3500 National plumbing and drainage set
- AS2200 Design charts for water supply and sewerage
- Building Code of Australia.

Manufacturer requirements include:

- material specifications
- pump tables
- sizing tables
- technical and trade manuals.

Desktop study includes collection and interpretation of existing data for design purposes from:

- architectural and building plans
- council plans
- developer plans
- other documents, including:
 - applications
 - forms
 - sewer detail maps
 - other reports as available.

Performance requirements include:

- pipe grades, cover, flow conditions and discharge requirements, established using Australian and New Zealand standards and local authority plans.

Layout of pipework systems:

- includes consideration of:
 - amenity of the building
 - clipping and pipe support
 - fireproofing
 - function of the building

RANGE STATEMENT

- impingement on floor heights
- materials to be used
- size of penetrations
- type of building structure
- should not unduly affect building integrity and aesthetic appeal
- should include principles of economy, serviceability, durability and fit for use should be applied.

Fittings and valves include:

- air admittance
- bends
- inspection and maintenance access
- junctions
- pressure relief
- reflux valves
- traps.

Pipe size calculations include:

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

Pipe fixings include:

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

Pumpwell, pump and pump control requirements include:

- automatic controls
- capacity
- corrosion-resistant materials
- detailing
- high and low-level water controls and alarms
- impeller sizing
- inlet and outlet design requirements
- installation and mounting requirements
- macerator requirements
- pump selection
- pump sizing
- pumpwell sizing

RANGE STATEMENT

Materials include:

- space requirements
- vacuum pump systems
- valve requirements
- warning system.
- appropriate materials specified based on:
 - compatibility
 - cost effectiveness
 - durability
 - fit for purpose
- high density polyethylene (HDPE)
- polyvinyl chloride (PVC)
- stainless steel.

Joining methods include:

- brazing
- gluing
- mechanical joints
- rubber ring
- solvent cement welding
- threading.

Installation requirements include:

- bedding
- clipping
- concrete support
- installation details
- jointing requirements
- level of workmanship.

Computer software packages include:

- manufacturers' software
- proprietary design software.

Plans:

- include:
 - appropriate design, sizing, notes and legend
 - compliance with industry conventions
 - production to industry standards and in accordance with regulatory and manufacturer requirements
- being produced by using:
 - computer generation
 - Indian ink
 - pencil
 - pigment liner
- may also include:

RANGE STATEMENT

- axonometrics
 - cross-sections
 - details
 - elevations
 - isometrics
 - schematics
 - sections.
- Specification*** includes:
- bedding
 - clipping
 - concrete support
 - details of specialised components
 - fittings
 - installation methods
 - installation standards
 - jointing
 - manufacturer requirements
 - materials
 - pipework
 - vacuum sewerage components
 - vacuum sewerage fixtures
 - valves
 - workmanship.
- Testing*** includes:
- compressed air test
 - flow testing
 - hydrostatic test
 - inspection checklist
 - quality assurance (QA) audit.
- Commissioning schedule*** includes:
- checking for:
 - burrs and obstructions
 - fitness for purpose
 - flushing system
 - removing contaminants
 - checking vacuum leaks.
- Operation and maintenance manual*** includes:
- checking for blockages
 - leak detection
 - maintenance intervals
 - operation guidelines
 - required maintenance
 - system inspection checklist

RANGE STATEMENT

- vacuum pump maintenance.

Unit Sector(s)

Unit sector Plumbing and services

Co-requisite units

Co-requisite units Nil

Functional area

Functional area