



Australian Government

Assessment Requirements for CPCPPS5033 Design vacuum drainage systems

Release: 3

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Modification History

- Release 2 This version first released with CPC Construction, Plumbing and Services Training Package Release 6.2.
- Removed duplicated heading from Performance Evidence.
- Release 1 This version first released with CPC Construction, Plumbing and Services Training Package Release 5.0.
- Supersedes and is equivalent to CPCPPS5033A Design vacuum sewerage systems. Updated to meet the Standards for Training Packages 2012.

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 vacuum infrastructure sewer system for:
 - a residential development of 50 properties incorporating:
 - vacuum sewage collection chambers
 - vacuum sewer mains
 - vacuum pump station
 - pump rising main
 - ventilation
 - odour control
 - a high-rise mixed development building, to a minimum of 29 floors, inclusive of a basement, to include fixtures on each floor level, incorporating:
 - vacuum pump station
 - vacuum sanitary drainage system
 - pump rising main
 - ventilation
 - odour control
- applying sustainability principles and concepts throughout to achieve a star rating under the Green Building Council of Australia rating scheme
- evaluating and documenting design parameters, including client, regulatory and manufacturer requirements and relevant Australian Standards and codes complex sanitary plumbing and drainage systems
- evaluating health risks associated with the sanitary plumbing and drainage system

- selecting materials and components for compliance, fitness for purpose, durability, compatibility and cost-effectiveness.

Knowledge Evidence

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

- common terminology and definitions used in the design of vacuum drainage systems
- application of statutory and regulatory requirements and relevant Australian Standards and codes including:
 - Acts, regulations and Commonwealth, state or territory and local government policies
 - AS/NZ 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
- scope of work requirements:
 - interpreting plans and specifications
 - sizing and documenting layout of vacuum drainage systems including residential, commercial and industrial
- design requirements:
 - acoustic performance
 - architectural plans
 - building specifications
 - fire safety requirements
 - flow requirements and sizing of pipework
 - odour control
 - owner requirements
 - pipework identification
 - Sewerage Code of Australia
 - vacuum pumping station
 - ventilation requirements
- cost-benefit analysis comparing 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:
 - copper (Cu)
 - polyethylene (PE)
 - polypropylene (PP)
 - polyvinyl chloride (PVC)
 - stainless steel
 - other approved material

- manufacturer requirements:
 - material specifications
 - collection and storage systems
 - design and installation
 - equipment installation
 - pump installation
 - selection of compatible sanitary fixtures
 - technical manuals
- manufacturer specifications, including hazards identified in relation to devices and systems used
- information required to conduct a desktop study to outline design parameters:
 - architectural and building plans
 - developer plans
 - manufacturer data
 - other documents relevant to designing vacuum sewerage systems
- characteristics and application of different jointing methods
- vacuum drainage system attributes:
 - availability
 - cost
 - flexibility
 - installation requirements
 - low water usage
 - risks
 - vacuum loading units (VLU)
 - site conditions
- performance requirements of vacuum drainage system:
 - discharge requirements
 - durability
 - emergency storage and/or power backup
 - longevity
 - self-cleaning ability
 - sufficient capacity
- layout of pipework systems:
 - sewer infrastructure systems:
 - cover
 - grade
 - location of vacuum pump station
 - location of vacuum sewage collection chambers
 - odour control
 - pipe access

- ventilation
- high-rise building projects:
 - acoustic performance
 - amenity of the building
 - clipping and pipe support
 - location of pipework (fire rating of enclosure)
 - function of the building
 - impingement on floor heights
 - materials to be used
 - size of penetrations
 - type of building structure
- effect on building integrity and aesthetic appeal
- principles of economy, serviceability, durability and fit for use
- installation requirements:
 - acoustic performance
 - bedding
 - pipe protection:
 - cover
 - corrosion
 - impact
 - grade
 - level of workmanship
 - fire rating
 - manufacturer-recommended specific fixings
 - pipe support
 - provision for pipe movement
 - serviceability and access
- pipe size calculations including:
 - determining flow and fixture loadings
 - equivalent population (EP) density
 - calculating gradient
 - interpreting design charts and tables
 - determining self-cleaning velocities
 - manufacturer requirement
 - probable simultaneous demand
- uses and limitations for pipe supports:
 - bedding
 - bracket spacing
 - concrete support
 - corrosion protection

- cover
- hanging brackets
- manufacturer-recommended specific fixings
- material requirements
- provision for expansion
- thrust blocks
- wall and ceiling brackets
- vacuum pumping station and pump control requirements:
 - access covers
 - automatic controls
 - capacity
 - corrosion-resistant materials
 - detailing
 - emergency storage
 - emergency power supply
 - high and low-level water controls and alarms
 - impeller sizing
 - inlet and outlet design requirements
 - installation and mounting requirements
 - macerator requirements
 - odour control
 - pneumatic control switch assembly
 - pump selection
 - pump sizing
 - pump well sizing
 - space requirements
 - vacuum pump systems
 - valve requirements
 - ventilation
 - warning system
- characteristics and application of different fittings, valves and controls:
 - fittings:
 - bends
 - elbows
 - inspection and maintenance access
 - tees
 - unions
 - valves:
 - backflow prevention
 - isolating

- non-return
- strainers
- vacuum diaphragm valve
- controls:
 - pneumatic control switch assembly
 - vacuum pressure sensing
 - motorised actuated valves
 - vacuum management system
- the use and limitations of computer software packages including manufacturer and proprietary design software
- plans and specifications requirements:
 - plans:
 - axonometrics
 - cross-sections
 - details
 - elevations
 - isometrics
 - schematics
 - site
 - sections
 - specifications:
 - access chambers (manholes)
 - bedding
 - commissioning
 - concrete support and detailing specialised components
 - jointing
 - manufacturer requirements
 - materials
 - odour control
 - pump rising main
 - work health and safety (WHS)
 - selection of compatible vacuum sanitary fixtures
 - support
 - testing
 - vacuum pump station
 - vacuum drainage collection chambers
 - vacuum sewer mains
 - ventilation
 - workmanship
- testing methods:

- compressed air test
- flow testing
- hydrostatic test
- inspection checklist
- performance
- vacuum
- quality assurance (QA) audit
- commissioning schedule requirements:
 - system certification
 - check for foreign material
 - leak check
 - emergency procedures
 - system defects
 - system functions as per design
- operation and maintenance manual requirements:
 - as installed drawings
 - results of commissioning test
 - certification documentation
 - maintenance schedules
 - manufacturer brochures and technical information
 - operating procedures
- sustainability principles and concepts:
 - selecting appropriate material to ensure minimal environmental impact
 - efficient use of material
 - efficient energy usage/capital outlay comparison
 - positive effect on the environment in regard to no potential overflow or leakage
 - water efficient
 - consideration of the Green Building Council of Australia rating scheme
 - local environment consideration overflow disposal/reuse.

Assessment Conditions

Assessors must meet the requirements for assessors contained 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 volumes to this training package are available at the VETNet website -

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