



Australian Government

CPCCPWP5001 Design below ground waterproofing

Release: 1

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Modification History

- Release 1 This version first released with CPC Construction, Plumbing and Services Training Package Release 9.0.
Newly created unit.

Application

This unit of competency specifies the skills and knowledge required to design below ground waterproofing systems for buildings and structures.

The unit applies to Class 1 and 10 Buildings, and Class 2 to 9 Buildings.

The unit includes planning and preparing to design waterproofing systems, analysing risk, and carrying out a detailed design of the waterproofing system solution.

The unit is suitable for builders, building surveyors, building designers, architects, waterproofing design specialists and consultants, engineers and other design specialists.

Licensing, legislative, regulatory or certification requirements may apply to this unit. Relevant work health and safety (WHS) state and territory regulatory authorities should be consulted to confirm jurisdictional requirements.

Pre-requisite Unit

Nil.

Unit Sector

Building and Construction

Elements and Performance Criteria

Elements describe the essential outcomes.

Performance criteria describe what needs to be done to demonstrate achievement of the element.

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|----------------------|--|
| 1. Plan and prepare. | 1.1 Determine the use of the area and most appropriate form of the waterproofing system, including proposed finishes in accordance with stakeholder needs. |
| | 1.2 Determine site conditions and plan a basement waterproofing brief in consultation with all stakeholders identifying challenges and waterproofing system design |

requirements.

- 1.3 Assess types of construction proposed and their permeability to water and moisture, including concrete, masonry and framing to be managed and identify potential water ingress points.
 - 1.4 Review drainage system requirements in accordance with the design team.
2. Carry out risk analysis.
 - 2.1 Assess risk of water bearing to full extent of the structure and the effects of hydrostatic pressure on the proposed waterproofing system.
 - 2.2 Assess risks of possible defects in the waterproofing system.
 - 2.3 Assess consequence of water and moisture ingress into an area of the basement.
 - 2.4 Determine the risk of internal condensation and control measures with the design team.
 - 2.5 Determine feasibility of the proposed waterproofing design for the structure and the construction sequence.
 - 2.6 Review any requirement for repair and maintenance of the waterproofing system post construction.
 - 2.7 Analyse site environmental conditions according to approved plans, including surface and sub-surface drainage.
3. Carry out design.
 - 3.1 Identify and assess below ground waterproofing systems available to suit the design that is appropriate for the conditions and in line with the risk analysis.
 - 3.2 Provide detailed design drawings for the installation of the waterproofing system, including factors such as building construction method and construction sequencing, substrate considerations and compatibility with the waterproofing system and other related building elements in accordance with stakeholder needs.
 - 3.3 Provide a basement waterproofing requirement and specification in accordance with the agreed

waterproofing design brief and stakeholder needs.

- 3.4 Carry out a review of and ensure compliance with relevant regulations, National Construction Code (NCC) performance requirements, Australian Standards, work health and safety (WHS), environmental requirements and manufacturers' requirements.
- 3.5 Carry out a safety in design analysis of the proposed waterproofing system.
- 3.6 Provide quality assurance inspection protocols for the waterproofing installation, including substrate assessment for suitability, compliance of membrane installation with project specifications, completion inspection processes and repair and maintenance plan.
- 3.7 Produce and submit design to stakeholders.

Foundation Skills

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

Unit Mapping Information

No equivalent unit.

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>

Assessment Requirements for CPCCWP5001 Design below ground waterproofing

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Performance Evidence

A person demonstrating competency in this unit must satisfy the requirements of the elements, performance criteria and foundation skills of this unit, in addition to the specific performance and knowledge evidence described below.

Candidates must:

- develop two (2) basement waterproofing designs.

In doing so, the candidate must:

- develop one (1) design for a residential habitable below ground dry space
- develop one (1) design for a multi-level below ground space with a lift pit in conditions of variable high-water table
- design a combined system for each which must incorporate at least two of the following systems:
 - membrane barrier
 - integral waterproofing
 - cavity drains
- provide evidence of compliance of design requirement with National Construction Code (NCC) performance requirements.

The evidence of compliance report must identify:

- class of building
- waterproofing system and its components
- stakeholders consulted
- nominate relevant NCC clauses the design conforms to
- nominate any Australian Standards the design has referenced and must conform to
- requirements for maintenance
- provide a risk assessment report for the two Classes of Buildings used detailing the:
 - waterproofing solution suitability for the project conditions
 - management of potential defects in the waterproofing system
 - consequences of water entering the relevant space

- feasibility of repair of the waterproofing system
- safety in design procedures carried out.

Knowledge Evidence

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

- key principles of water movement, drainage, water tables and hydrostatic pressure/capillarity
- methods for relieving hydrostatic pressure during construction
- various types of piling and how they affect waterproofing design, including:
 - sheet
 - contiguous
 - secant
 - soldier
- types of commercial basement construction and how they affect waterproofing design, including:
 - top down
 - bottom up
 - diaphragm walls
 - hydrostatic floors
- considerations for waterproofing:
 - stakeholder brief
 - hydrology or geotechnical reports
 - site conditions
 - space to be waterproofed
 - water table and its effects on the waterproofing solution considered
 - water management of exposed rock basement walls and their internal drainage systems
 - salts
 - acidic and alkaline soils
 - underground gases
 - moisture vapour transmission
- factors relating to soil permeability, grading, loading and consolidation
- various types of concrete and masonry and their permeability to moisture
- methods of waterproofing used during construction for various wall and floor designs
- key design philosophies for below ground waterproofing, including:
 - effects of loads on a material, deformation, stress/strain, especially flexural, compressive and tensile stresses
 - effects of hydrostatic pressure on a waterproofed system and floatation
- ventilation requirements in a building, including heating, ventilation and air conditioning (HVAC) requirements
- below ground waterproofing systems available to the designer, including:

- bonded and unbonded sheet membranes
- hydrophilic seals and systems
- liquid applied membranes
- positive and negative systems
- chemical grouts
- injection systems
- sealants
- internal cavity drainage systems
- membrane barriers - positive and negative
- building elements and integration, including:
 - product properties and compatibility with building elements
 - installation method and practices
 - stages of installation and inspection benchmarks
 - waterproofing systems design and relationship with building design
 - permanent formwork
- integral waterproofing systems
- cavity drain systems
- correct application rates of specified waterproofing systems
- methods for calculating the quantities of product required to complete the waterproofing system specified
- advantages and disadvantages of the different systems, including:
 - combinations of different systems and their limitations
 - advantages and disadvantages of different systems
 - maintenance and aftercare requirements
 - the form and feasibility of waterproofing systems for remedial work
- general principles of cementitious modified waterproofing systems, including sand/cement mixes, hydration of cements, shrinkage, bonding, importance and construction of floor and wall junctions, fixings and decoration
- general principals of integral protection waterproofing systems
- general principles for cavity drains (internal and external), including fixings, lapping, sumps and pumps, floor and wall junction construction
- a range of internal floor and wall finishing systems possible, including decorative finishes
- maintenance of water management systems (land drains, sumps, pumps and internal drainage channels)
- implications of dampness affecting structural steel in buildings
- properties of waterproofing systems available:
 - substrate assessment and preparation
 - combining components to form a system
 - component compatibility in a combined system
 - component properties for site conditions
 - component installation practices

- construction drawing/computer-aided drawing (CAD) development and specification writing:
 - types/styles of construction drawings to be used and how to integrate into the building design
 - technical specification writing skills
 - appropriate construction terms and definitions
 - technical report writing skills
- document control:
 - project document flow, numbering and tracing for drawings and other written documentation
 - document layout, language and filing/storage
 - other documents:
 - compliance reports
 - request for information
 - site inspection report
 - meeting minutes - taking/control/distribution
- final design report:
 - waterproofing system design analysis for compliance to design brief
 - design decisions made and key milestones achieved
 - finalised design approved
- safe work installation practices
- assessment of complex water and moisture ingress situations:
 - moisture and water remedial system relationships
 - combination of systems to form multiple barriers
- stakeholders:
 - architect
 - structural engineer
 - civil engineer
 - HVAC engineer
 - builder
 - building owner
 - consumer
 - design team
 - construction team
 - certifier
 - building surveyor
 - regulators
- environmental considerations and management
- relevant regulations and legislation.

Assessment Conditions

Assessors must meet the requirements for assessors contained in the Standards for Registered Training Organisations.

Assessment of performance must be undertaken in the workplace or simulated workplace environment. A simulated workplace is one that fully replicates the resources, environment and any time and productivity pressures that exist in the actual workplace, and which meets industry standards for safety and environmental practices.

Candidates must have access to:

- relevant task or design specifications
- Australian Standards, relevant building legislation, industry codes, NCC and requirements of workplace policies and procedures as required by Commonwealth, state and territory regulators
- relevant environmental requirements.

Links

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