



Australian Government

Department of Education, Employment and Workplace Relations

CPPSIS5016A Design a stormwater system

Release: 1

CPPSIS5016A Design a stormwater system

Modification History

Not Applicable

Unit Descriptor

Unit descriptor

This unit of competency specifies the outcomes required to design and set out a basic stormwater system and associated engineering structures. It requires the ability to undertake all aspects of survey design, including understanding client and registered surveyor requirements and the special characteristics of a given site, and applying relevant legal and statutory requirements to the design. The selection of appropriate equipment and procedures is essential to performing the task safely and efficiently. Functions would be carried out within organisational guidelines.

Application of the Unit

Application of the unit

This unit of competency supports the application of self-management, accuracy and problem-solving skills; high-level understanding of technology; designing data; and implementing specifications. The skills and knowledge acquired upon completion of this unit would support the needs of employees in surveying.

Licensing, legislative, regulatory and certification requirements may impact on this unit. Incorporate these requirements according to state, territory and federal legislation.

Licensing/Regulatory Information

Refer to Application of the Unit

Pre-Requisites

Prerequisite units Nil

Employability Skills Information

Employability skills The required outcomes described in this unit of competency contain applicable facets of employability skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged, will assist in identifying employability skills requirements.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency. Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Organise resources.	1.1 Characteristics of the operating environment and any special equipment or resource requirements are identified according to organisational guidelines. 1.2 Equipment is checked to be in good working order. 1.3 Manufacturer specifications with regard to the use of equipment are complied with.
2 Follow specifications to design stormwater system.	2.1 Objectives, principal work activities and constraints are defined and documented according to written survey specifications and client requirements. 2.2 Objectives and principal work activities are communicated to relevant personnel. 2.3 Details of instruments and basic techniques to be used are considered and evaluated. 2.4 Stormwater design is determined according to objectives.
3 Conduct the design of a stormwater system.	3.1 Calculations using a formula to find pressure at a point and depth of a hydraulic jack are conducted according to design type. 3.2 Atmospheric, gauge and absolute pressure are distinguished using measurements made with appropriate measurement equipment. 3.3 Pressure on plane and curved surfaces immersed in a liquid is calculated. 3.4 Different types of flow that occur in liquids in motion and the value of Reynolds s number are determined. 3.5 Discharge is calculated using continuity equation. 3.6 Channel flow formula is applied to calculate flow and determine the use of weirs to measure flow. 3.7 Equations are applied to calculate flow over sharp-crested weirs in channel measurements. 3.8 Hydrologic cycle, elements of meteorology, rainfall and catchment factors affecting rainfall run off are determined. 3.9 Correct OHS procedures are observed throughout the process. 3.10 Pertinent legislative requirements and legal and statutory standards are considered and adhered to.
4 Discuss design report with work team.	4.1 Feedback on surveying data components provided by team members is discussed and acted upon according to organisational guidelines.

ELEMENT	PERFORMANCE CRITERIA
5 Complete project to clients' requirements.	4.2 Skills and knowledge are updated to accommodate changes in stormwater design.
	5.1 Completed work is checked against clients' requirements according to the specifications.
	5.2 Required documentation is completed according to organisational guidelines.
	5.3 Relevant personnel are informed of the results according to organisational guidelines.
	5.4 Survey data is archived according to project specifications.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- ability to relate to people from a range of social, cultural and ethnic backgrounds and with a range of physical and mental abilities
- analytical skills
- ability to translate requirements into design
- communication skills to:
 - consult effectively with clients and colleagues
 - impart knowledge and ideas through oral, written and visual means
- computer skills (high technical user level) to complete business documentation
- interpreting project requirements
- instrument use (high level)
- literacy skills to:
 - assess and use workplace information
 - locate and interpret legislation and other written documentation
 - prepare and manage documentation
 - read and write technical reports
 - research and evaluate
- negotiation skills
- numeracy skills to:
 - analyse errors
 - conduct image analysis

REQUIRED SKILLS AND KNOWLEDGE

- interpret statistics
- perform mental calculations
- record with accuracy and precision
- undertake high level computations
- organisational skills to:
 - coordinate technical and human resource inputs to research activities
 - prioritise activities to meet contractual requirements
- spatial skills to:
 - exercise precision and accuracy in relation to spatial and aspatial data design
 - perform spatial data archival and retrieval and train others in this task
 - perform spatial data management and manipulation and train others in this task
 - perform file management and train others in this task
 - solve problems relating to height, depth, breadth, dimension, direction and position in actual operational activity and virtual representation
 - understand implications of height, depth, breadth, dimension and position to actual operational activity and virtual representation
- working in a team.

Required knowledge and understanding:

- advanced data reduction
- calibration of specialised surveying equipment
- data formats
- errors, accuracy and precision in design
- industry standards
- limitations of equipment
- organisational policies and guidelines, such as OHS guidelines
- planning and control processes
- safe work practices
- surveying reference systems
- surveying data capture and data set out methodologies
- understanding and application of high-level, relevant engineering-related tasks and associated computations
- understanding and application of road alignment design or stormwater system and associated computations.

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, the range statement and the Assessment Guidelines for this Training Package.

Overview of assessment

This unit of competency could be assessed on its own or in combination with other units relevant to the job function, for example units CPPSIS5018A Conduct an engineering survey, CPPSIS19A Conduct an engineering surveying project, CPPSIS5026A Design road and railway, and CPPSIS5027A Carry out a precision survey.

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:

- matching objectives with resources to ensure the design of the stormwater system proceeds in an organised and timely manner
- ensuring that achievement of required accuracy has been attempted by:
 - accessing and interpreting design information to identify the components to be measured and monitored
 - applying solutions to a range of problems
 - documenting and reporting
 - organising and prioritising activity
 - performing measurements
 - planning resources
 - survey data reduction and manipulation
- ensuring that non-conformity aspects are recorded and reported
- taking responsibility for own outputs in work and learning.

Specific resources for assessment

Resource implications for assessment include access to:

- assessment instruments, including personal planner and assessment record book
- assignment instructions, work plans and schedules, policy documents and duty statements
- registered training provider of assessment services
- relevant guidelines, regulations and codes of practice
- suitable venue and equipment.

Access must be provided to appropriate learning and assessment support when required.

Where applicable, physical resources should include equipment modified for people with disabilities.

Context of assessment	Holistic: based on the performance criteria, evidence guide, range statement, and required skills and knowledge.
Method of assessment	Demonstrated over a period of time and observed by the assessor (or assessment team working together to conduct the assessment). Demonstrated competency in a range of situations, that may include customer/workplace interruptions and involvement in related activities normally experienced in the workplace. Obtained by observing activities in the field and reviewing induction information. If this is not practicable, observation in realistic simulated environments may be substituted.
Guidance information for assessment	Assessment requires that the clients' objectives and industry expectations are met. If the clients' objectives are narrowly defined or not representative of industry needs, it may be necessary to refer to portfolio case studies of a variety of spatial information services requirements to assess competency. Oral questioning or written assessment and hypothetical situations (scenarios) may be used to assess underpinning knowledge (in assessment situations where the candidate is offered a preference between oral questioning or written assessment, questions are to be identical). Supplementary evidence may be obtained from relevant authenticated correspondence from existing supervisors, team leaders or specialist training staff. All practical demonstration must adhere to the safety and environmental regulations relevant to each State or Territory. Where assessment is for the purpose of recognition (recognition of current competencies [RCC] or recognition of prior learning [RPL]), the evidence provided will need to be authenticated and show that it represents competency demonstrated over a period of time. In all cases where practical assessment is used it will be combined with targeted questioning to assess the underpinning knowledge. Assessment processes will be appropriate to the language and literacy levels of the candidate and any cultural issues that may affect responses to the questions, and will reflect the requirements of the competency and the work being

performed.

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 in the performance criteria is detailed below. Add any 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.

Organisational guidelines may include:

- appropriate timelines
- code of ethics
- company policy
- final product formats
- formal design parameters
- legislation relevant to the work or service function
- manuals
- OHS policies and procedures
- personnel practices and guidelines outlining teamwork, work roles and responsibilities
- requirements for data processing.

Manufacturer specifications may include:

- equipment specifications
- operator manuals.

Objectives may include:

- agreed client requirements
- written survey specifications.

Principal work activities may include:

- the survey design of a stormwater system.

Constraints may include:

- coverage
- datum
- environmental factors
- industry requirements
- legal and statutory
- financial
- resource availability
- time.

Client requirements refer to description of outputs and may be contained in:

- contracts
- memos
- tender briefs
- verbal instructions

- Relevant personnel** may include:
- written instructions.
 - colleagues
 - registered surveyors
 - site personnel
 - staff or employee representatives
 - supervisors or line managers
 - suppliers
 - users.
- Techniques** may include:
- field
 - office procedures.
- Stormwater design** may include:
- compressibility of fluids
 - density
 - division between a solid and a fluid
 - gravity
 - intensity of pressure and pressure head
 - mass
 - total pressure
 - weight
 - surface tension
 - viscosity
 - urban.
- Calculations** may include:
- calculations for a two lane rural road, which may include:
 - cross-sections
 - grades and levels on grades
 - grade intersections
 - high and low points and levels in cross-sections
 - vertical curves, including levels and length
 - calculations for an urban road, which may include cut and fill volumes
 - calculation types include:
 - graphical and mechanical (planimeter) methods
 - mathematical rules such as mid-ordinate, trapezoidal and offsets at regular and irregular intervals from traverse to irregular boundaries, and radiation for irregular boundaries
 - volume from contours and spot heights
 - volume from cross-sections: mean area and end area using trapezoidal, prismoidal and Simpson's rules
 - volume of regular objects such as cone, cylinder, pyramid, wedge, frustum and sphere.

Design type may include:	• design details: • digital information • hard copy plans • maps • written instructions • stormwater system details.
Appropriate measurement equipment may include:	• manometers • mercury bowl • piezometer.
Different types of flow may include:	• open channels • pipes • pipe lines.
Reynolds s number refers to:	• a system that calculates the dispersion of solute into a slow stream of solvent.
Channel measurements may include:	• channel cross-sections • rectangular • trapezoidal • v-notch.
Elements of meteorology may include:	• graphs and charts associated with: • rain gauging • types of rainfall.
OHS may include:	• Australian standards • development of site safety plan • identification of potential hazards • inspection of work sites • training staff in OHS requirements • use of personal protective clothing • use of safety equipment and signage.
Legislative requirements may include:	• Australian standards • award and enterprise agreements • certification requirements • codes of practice • equal employment opportunity (EEO) • quality assurance requirements.
Legal and statutory standards may include:	• local government requirements • national standards • state statutes and regulations.
Surveying data components may include:	• depth • dimension • direction

- Clients** may include:
- flow rates
 - position
 - slope.
 - customers with routine or special requests
 - external to organisation
 - internal to organisation
 - regular and new customers, including:
 - members of the public
 - business enterprises
 - government agencies
 - suppliers.
- Documentation** may include:
- electronic or paper-based correspondence with client
 - field records
 - final report
 - records of conversation
 - survey plots
 - organisational work activity sheets.

Unit Sector(s)

Unit sector	Spatial information services
-------------	------------------------------