



Australian Government

Department of Education, Employment and Workplace Relations

CPPSIS5027A Carry out a precision survey

Release: 1

CPPSIS5027A Carry out a precision survey

Modification History

Not Applicable

Unit Descriptor

Unit descriptor

This unit of competency specifies the outcomes required to apply specialised techniques, instruments and instrument attachments for the purpose of carrying out precise setting out and industrial surveys. It requires the ability to use instruments or techniques to carry out precision surveys. Functions would be carried out within organisational guidelines.

Application of the Unit

Application of the unit

This unit of competency supports the application of communication, organisational, accuracy, problem-solving and time management skills; interpreting technical documentation; error analysis; and a sound understanding of technology. 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 Prepare to perform precision survey.	1.1 Task <i>objectives</i> are defined. 1.2 Skills and knowledge are updated to accommodate changes in design and set out survey.
2 Set up precise levelling and reduce the results of a precise levelling run.	2.1 <i>Pertinent standards</i> are identified, considered and adhered to according to <i>precision surveying project specifications</i> . 2.2 <i>Organisational documented and undocumented practices</i> are adhered to. 2.3 <i>OHS</i> requirements are planned for and adhered to. 2.4 Constructional features of the <i>equipment and the specialised attachments</i> necessary to achieve the requirements of <i>precise levelling</i> are determined. 2.5 Accuracy specifications as set out in the survey precision instructions or the <i>manufacturer specifications</i> for tolerances relevant to precise levelling are determined. 2.6 Precise levelling run of an accuracy consistent with the current relevant accuracy standard is carried out and results are calculated and recorded according to <i>organisational guidelines</i> .
3 Apply specialised techniques used for precise setting out and industrial surveys.	3.1 Applications of specialised surveying techniques used for precise setting out and <i>optical tooling</i> are determined. 3.2 Applications of <i>specialised instruments and instrument attachments</i> used for precise setting out are determined. 3.3 <i>Remote measuring systems</i> to be used in the industrial measurement are determined. 3.4 Set out and observations using instruments and attachments suitable for precise setting out are conducted.
4 Detect and monitor deflection and deformation of structures.	4.1 <i>Survey methods</i> used to check horizontal movement of engineering structures and instruments used to monitor verticality of tall structures are determined. 4.2 Survey methods used to check vertical movement due to settlement of engineering structures caused by tunnelling and mining are determined. 4.3 Precision survey of an accuracy that will detect and monitor deformation or deflection of an engineering structure is carried out.

ELEMENT	PERFORMANCE CRITERIA
5 Document results.	<p>5.1 Results of the survey are presented to <i>relevant personnel</i> according to organisational guidelines.</p> <p>5.2 <i>Required documentation</i> is completed promptly, accurately and according to organisational guidelines.</p> <p>5.3 Spatial data is archived according to project specifications.</p>

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 create, extract and output information from engineering plans
- 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
- 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 and apply surveying software
- 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
- numeracy skills to:
 - analyse errors
 - conduct image analysis
 - interpret and analyse statistics
 - perform mental calculations
 - record with accuracy and precision
 - undertake high level computations
- organisational skills to:

REQUIRED SKILLS AND KNOWLEDGE

- 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 survey set out
 - 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.

Required knowledge and understanding:

- data formats
- data management
- error analysis principles
- apply the basic principles of algebra, geometry and trigonometry
- industry requirements and standards
- interaction of surveying software with surveying equipment
- organisational policies and guidelines
- planning and control processes
- safe work practices
- spatial reference systems
- standard plan design and presentation conventions
- understanding and application of significance in calculations
- use of precision surveying instruments
- vocational issues involving precision surveying.

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, and CPPSIS5019A Conduct an engineering surveying project.

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:

- applying known solutions to a range of problems
- performing calculations following a logical progression and presenting clearly visible results
- assessing and recording computations from varied sources
- demonstrating operational knowledge in a broad range of areas relating to traverse computations
- applying mathematical principles and skills to a range of advanced surveying related problems
- understanding mathematical concepts and techniques
- performing a range of tasks where choice between a substantial range of options is required
- understanding purpose of numerically solving advanced surveying problems
- understanding requirement for accuracy in precision surveying calculations
- defining terms used in calculations
- 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	<p>Demonstrated over a period of time and observed by the assessor (or assessment team working together to conduct the assessment).</p> <p>Demonstrated competency in a range of situations, that may include customer/workplace interruptions and involvement in related activities normally experienced in the workplace.</p> <p>Obtained by observing activities in the field and reviewing induction information. If this is not practicable, observation in realistic simulated environments may be substituted.</p>
Guidance information for assessment	<p>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.</p> <p>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).</p> <p>Supplementary evidence may be obtained from relevant authenticated correspondence from existing supervisors, team leaders or specialist training staff.</p> <p>All practical demonstration must adhere to the safety and environmental regulations relevant to each State or Territory.</p> <p>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.</p> <p>In all cases where practical assessment is used it will be combined with targeted questioning to assess the underpinning knowledge.</p> <p>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</p>

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.

Objectives may include:

- agreed client requirements
- written survey data specifications.

Pertinent standards are standards essential to the accuracy of:

- calculation of horizontal and vertical information
- measurement and recording.

Precision surveying may include:

- accuracy standards and field procedures for high-precision horizontal and vertical control surveys, including high-precision global positioning system (GPS) surveys
- application of optical and electromagnetic measuring principles and techniques
- computation of three-dimensional coordinates and coordinate changes by intersection methods
- error analysis of survey measurements (angle, distance and height difference)
- deformation and tunneling surveys and analysis, pre-analysis and design of survey projects
- laser scanner methods
- scale bar on target methods.

Project specifications refer to:

- detailed technical descriptions of the survey data and its requirements.

Organisational documented and undocumented practices may include:

- appropriate timelines
- data processing requirements
- final product formats
- formal design parameters
- teamwork.

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.
- Equipment and specialised attachments*** may include:
- electronic theodolites
 - GPS
 - gyro-theodolite
 - lasers
 - levels
 - optical reading instruments
 - tapes
 - total station (reflectorless)
 - total station (theodolite function).
- Precise levelling*** may include:
- effects of curvature and refraction on levelling
 - geodetic relationships of the size and shape of the earth
 - sources of errors in precise angle observations and the techniques used to minimise their effects
 - use of statistics to analyse geodetic observations, values and positional results.
- Manufacturer specifications*** may include:
- equipment specifications
 - operator manuals.
- Organisational guidelines*** may include:
- code of ethics
 - company policy
 - legislation relevant to the work or service function, including equal employment opportunity (EEO)
 - manuals
 - OHS policies and procedures
 - personnel practices and guidelines outlining work roles and responsibilities.
- Optical tooling*** may include:
- auto collimation
 - auto reflection
 - collimation.
- Specialised instruments and instrument attachments*** may include:
- auto collimation and laser eyepieces
 - hollow axis theodolites
 - parallel plate micrometers
 - pentaprism attachments
 - specialised instrument stands
 - stage plates
 - tooling bars
 - zenith and nadir auto plumb instruments.
- Remote measuring systems***
- precise intersection techniques

may include:

- robotic instruments
- terrestrial photogrammetry.

Survey methods may include:

- inertial surveying
- remote surveying:
 - airborne electromagnetic radiation (EMR) imagery
 - robotic total station
 - terrestrial photogrammetry.

Relevant personnel may include:

- managers
- site personnel such as field hands
- supervisors
- surveyors.

Required documentation may include:

- field records
- final product reports
- survey plots.

Unit Sector(s)

Unit sector

Spatial information services