



Australian Government

Department of Education, Employment and Workplace Relations

NWP554 Apply surveying computations to civil engineering projects

Release: 1

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Modification History

NWP554 Release 1: Primary release.

Unit Descriptor

This unit of competency sets out the knowledge and skills required to apply computational concepts and methods that are common to civil engineering and surveying projects. This includes the conversion of survey measurements and data into surveying and mapping coordinates and computational set out data to facilitate the construction of an engineering project. This does not include the use of calculus.

Application of the Unit

This unit applies to engineering and surveying para-professionals required to undertake measurement and set out of engineering works. This may include office, and fieldwork. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

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 tasks you need to be able to perform, to demonstrate that you can achieve the element. Where ***bold italicised*** text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

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|--|---|
| 1 Identify surveying computational requirements | 1.1 Determine the surveying <i>computational task</i> through requests, design briefs or equivalent and clarify with the <i>appropriate personnel</i> .
1.2 Seek expert advice when appropriate and according to <i>enterprise procedures</i> .
1.3 Consult appropriate personnel to ensure the work is co-ordinated effectively with others involved at the work site. |
| 2 Select appropriate surveying computational method | 2.1 Interpret and apply industry codes, regulations and technical documentation relevant to the surveying computational task.
2.2 Identify and use <i>sources of computational data</i> .
2.3 Make and record appropriate assumptions underlying the surveying computational task.
2.4 Select the most appropriate computational method.
2.5 Identify, obtain and check required <i>resources</i> as fit for purpose. |
| 3 Perform computation | 3.1 Perform arithmetic operations, including decimals and fractions.
3.2 Perform efficient computations using a scientific calculator.
3.3 Record results of computations.
3.4 Select methods for dealing with unexpected situations on the basis of discussions with appropriate personnel, job specifications and enterprise procedures. |
| 4 Verify, present and interpret outcomes | 4.1 Record and document the results of the analysis in accordance with requirements and enterprise procedures.
4.2 Discuss and verify the outcomes of analysis with appropriate personnel.
4.3 Present outcomes as required by initial request or brief and/or organisational requirements. |

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills:

- manually compute horizontal angles from observed directions
- manually calculate horizontal angular misclosures and compute bearings
- manually compute vertical angles from vertical circle readings
- manually correct measured distances for meteorological effects
- manually convert slope distance and vertical angle to horizontal distance and vertical component
- manually compute height difference from vertical component, height of instrument and height of target
- manually convert horizontal distances and bearings to eastings and northings
- use personal computer to access and use organisational specific engineering/computational applications

Required knowledge:

- coordinate geometry
- mathematical and arithmetic area operations
- relation between horizontal distance and bearings and directional standards (Eastings/Northings)

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.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The candidate should demonstrate the ability to:

- apply computational concepts and methods that are common to civil engineering and surveying projects.
- apply mathematical concepts in to engineering problems to familiar and unfamiliar situations and in different contexts.

Context of and specific resources for assessment

Access to the workplace and resources including:

- documentation that should normally be available in a water industry organisation
- workplace specific equipment and technology
- supervision and experienced team members to provide observations, feedback and third party reports
- enterprise operating procedures and work allocation
- relevant codes, standards, and government regulations.

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

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

Assessment processes and techniques must be culturally appropriate, and appropriate to the language and literacy capacity of the candidate and the work being performed.

Validity and sufficiency of evidence require 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 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
- a decision of competence should only be made when the assessor has complete confidence in the person's competence over time and in various contexts
- all assessment that is part of a structured learning experience must include a combination of direct, indirect and supplementary evidence
- where assessment is for the purpose of recognition (RCC/RPL), the evidence provided will need to be

authenticated and show that it represents competency demonstrated over a period of time

- assessment can be through simulated project-based activity and must include evidence relating to each of the elements in this unit.

In all cases where practical assessment is used it will be combined with targeted questioning to assess the underpinning knowledge. Questioning will be undertaken in a manner appropriate to the skill levels of the candidate, any cultural issues that may affect responses to the questions, and reflecting the requirements of the competency and the work being performed.

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.

Computational task must include:

- arithmetic
- algebra
- geometry
- co-ordinate geometry
- matrices
- quadratic functions
- exponential and logarithmic functions
- trigonometric functions
- charts and graphs

Appropriate personnel may include:

- supervisor
- colleague
- foreman
- team leader
- supervising engineer
- teacher

Enterprise procedures may include:

- the use of tools and equipment
- instructions, including job sheets, cutting lists, plans, drawings and designs
- reporting and communication
- manufacturers' specifications and operational procedures

Sources of computational data may include:

- tables
- graphs

Resources may include:

- computer
- scientific calculator
- engineering tables and graphs
- regulations and codes of practices

Unit Sector(s)

Not applicable.

Competency Field

Civil Engineering.