DCS41983

Use Surveying in Engineering

Descriptor	This unit covers the competency to use current survey equipment to perform basic measurement and layout tasks on construction sites.
Hours	40 hours
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.
Pre/co-requisite units	Nil
Application	This unit applies to technician level activities in a Civil Engineering environment.

ELEMENT Elements describe the outcomes of a unit of competency.	**PERFORMANCE CRITERIA** Performance Criteria specify the level of performance required to demonstrate achievement of the Elements. Terms in italics are elaborated in the Range Statement.
1 Perform levelling traverse procedures.	1.1 Explain the terms Australian Height datum, level surface, horizontal surface and coordinate systems 1.2 Determine the horizontal collimation error of a level by using the two peg test 1.3 Outline the adjustment procedures for the main types of levels 1.4 Identify the main sources of error in levelling operations 1.5 Observe levels in a closed traverse to *third order* precision 1.6 Reduce levels in a closed traverse using the rise and fall method and the collimation height method 1.7 Perform levelling observations incorporating intermediate sight and inverted staff readings 1.8 Complete reduction methods for both methods 1.9 Show all mathematical checks 1.10 Describe the procedures for traversing levels in single and two-storey buildings
2 Determine bearings for the sides in a traverse.	2.1 Describe, in detail, the correct setup procedure for s*urvey equipment* over a ground mark. 2.2 Use the repetition method to observe horizontal angles in a traverse and reduce the measured angles 2.3 Calculate the angular misclose in a closed traverse, as well as the adjusted angle calculated 2.4 Observe and reduce vertical angles
3 Observe short distances to industry standards for engineering surveys.	3.1 Identify the major sources of error in distance measuring operations 3.2 Describe, in detail, the use of a band or tape to measure distances of up to 100m to engineering survey accuracy 3.3 Examine and discuss sources of errors when performing distance measurement with a band or tape 3.4 Calculate the reduced horizontal distance for taped lines allowing for temperature, tension, sag and slope correction 3.5 Use an EDM device to measure the distance of a line previously measured by tape or band. 3.6 Compare and discuss the results obtained via tape and EDM measurements
4 Perform detail surveys using the grid levelling method.	4.1 Describe, in detail, the procedure for laying out a grid at a specified interval over a given area 4.2 Observe levels on grid points to obtain spot heights for contouring 4.3 Produce a contour plan from spot heights
5 Perform simple detail surveys using industry survey equipment.	5.1 Perform detail surveys by distance and offset measurements along a base line
6 Produce and interpret simple site plans.	6.1 Plot a site plan from distance and offset measurements along a base line
7 Set out works using simple plans.	7.1 Describe, in detail, the use of a site plan to set out works by distance and offset measurements along a base line

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level required to complete this unit.

Essential knowledge:

- Australian Height Datum
- UTM grid referencing
- Local and national grid systems
- Referencing systems i.e. GPS
- Bearings
- Spot heights
- Methods of site set out
- Surveying set out techniques
- Survey calculations for height, distance and bearing
- Surveying equipment types and their accuracies
- Interpolation of contours from spot heights

Essential skills:
Ability to:

- Measure distance and height.
- Perform levelling operations.
- Perform and close a traverse.
- Produce basic contour plans.
- Set out works using simple site plans.

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. 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.	
minor civil engineering may include	• Subdivision work of up to 10 lots including lot set out, road alignment, services set out. • Structural work for one and two storey structures
Survey equipment. may include	• Laser level • EDM survey equipment • Measuring tapes

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 course.

Critical aspects of assessment and evidence required to demonstrate this competency unit:	All survey work is to be carried out to an accuracy commensurate with the nature of the project undertaken.
Access and equity considerations:	The assessment environment should not disadvantage the candidate.
Context of and specific resources for assessment:	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team.
Method of assessment:	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples, questioning, workplace-supervised practicals, remote labs, simulations, video and other techniques as required. Questioning should not require language, literacy and numeracy skills beyond those required in this unit. The candidate must have access to all tools, equipment, materials and documentation required and must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.