SQA Advanced Unit Specification

General information for centres

Unit title: Construction Site Surveying A

Unit code: HR48 47

Unit purpose: This Unit is designed to develop candidate knowledge and skills in the basic techniques of land surveying — use of plans and maps; instrument work and measurement; areas and volumes; setting out - for construction purposes.

On completion of the Unit the candidate should be able to:

1 Carry out information gathering from Ordnance Survey plans and site plans to determine co-ordinates, distances, gradients, bearings and areas.
2 Carry out a levelling survey and calculate the results to determine contours, sections and volumes.
3 Carry out the measurement of angles and distances for survey purposes.
4 Set out basic construction works in line and level.

Credit points and level: 1 SQA Credit at SCQF level 7: (8 SCQF credit points at SCQF level 7*).

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from National 1 to Doctorates.*

Recommended prior knowledge and skills: No specialist prior knowledge or skills are required by candidates for this Unit. However, prior knowledge and skills in trigonometry and general map reading would be advantageous.

Core Skills: There are opportunities to develop the Core Skills of Communication, Numeracy, Problem Solving, and Working with Others in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

Context for delivery: If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

Assessment: It is possible to assess candidates on an individual outcome basis, or by combinations of outcomes. Assessment should be conducted under supervised conditions. The assessment(s) of learning outcome 1 should consist of an appropriate balance of short answer, restricted response and structured questions in open book format. The assessment of learning outcomes 2, 3 and 4 involves practical field surveys in groups with subsequent work done individually. It should be noted that candidates must achieve all the minimum evidence specified for each outcome in order to complete the unit successfully.

Where evidence for outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

The sections of the unit stating outcomes, knowledge and/or skills, and evidence requirements are mandatory.

An exemplar instrument of assessment and marking guidelines has been produced to provide examples of the type of evidence required to demonstrate achievement of the aims of this Unit and to indicate the national standard of achievement at SCQF level 7.

SQA Advanced Unit specification: statement of standards

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The sections of the Unit stating the Outcomes, knowledge and/or skills, and evidence requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Throughout the unit emphasis will be placed where appropriate on the application of Health & Safety and Sustainability. Safe working practices should be looked at in accordance with current safety codes of practice and regulations. Sustainability should include reference to criteria affecting sustainability, the impact on the environment of not implementing sustainability, and the legislation promoting sustainability.

Outcome 1

Carry out information gathering from Ordnance Survey plans and site plans to determine co-ordinates, distances, gradients, bearings and areas

Knowledge and/or skills

- Ordnance Survey co-ordinates and levels
- Map and plan scales
- Local co-ordinates and levels
- Partial co-ordinates
- Distances and bearings
- Regular and irregular areas

Evidence Requirements

Candidates will need to provide evidence to demonstrate their knowledge and/or skills by showing that they can:

- explain co-ordinate and/or heighting systems
- select appropriate methods of calculation
- calculate distance and/or bearing and/or gradient and/or partial/total co-ordinates and/or areas from data

Evidence for the knowledge and/or skills for this Outcome will be provided on a sample basis. In any assessment of this Outcome, a minimum of **four out of six** knowledge and/or skills items should be sampled. In order to ensure that candidates will not be able to foresee which items they will be questioned on, a different sample of knowledge and/or skills items is required each time the outcome is assessed. Candidates must provide a satisfactory response in regard to all four knowledge and/or skills items.

Evidence should be generated through assessment undertaken in controlled supervised conditions. Assessment should be conducted under open book conditions.

Assessment guidelines

Questions used to elicit candidate evidence should take the form of an appropriate balance of short answer, restricted response and structured questions.

Outcome 2

Carry out a levelling survey and calculate the results to determine contours, sections and volumes

Knowledge and/or skills

- OS and temporary benchmarks
- Rise and fall method
- Collimation method
- Booking checks
- Contouring and sections
- Regular and irregular volumes

Evidence Requirements

Candidates will need to provide evidence to demonstrate their knowledge and/or skills by showing that they can:

- carry out a levelling survey
- calculate reduced levels
- use calculated and/or given levels for plotting and/or volume estimation purposes

Evidence for the knowledge and/or skills for this Outcome will be provided on a sample basis. In any assessment of this Outcome, a minimum of **four out of six** knowledge and/or skills items should be sampled. In order to ensure that candidates will not be able to foresee which items they will be questioned on, a different sample of knowledge and/or skills items is required each time the outcome is assessed. Candidates must provide a satisfactory response in regard to all four knowledge and/or skills items.

Evidence should be generated in supervised conditions with candidates working in groups to undertake the fieldwork and individual candidates processing the derived data. Assessment should be conducted under open book conditions on a continuous basis.

Assessment guidelines

Where group work is involved, each candidate must participate in each aspect of the practical fieldwork required, exhibiting the required level of competence.

The assessment for this outcome might be combined with those for Outcomes 3 and 4 of this Unit.

Outcome 3

Carry out the measurement of angles and distances for survey purposes

Knowledge and/or skills

- Theodolite use
- Distance measurements
- Linear tape survey
- Checking methods
- Plotting results to scale

Evidence Requirements

Candidates will need to provide evidence to demonstrate their knowledge and/or skills by showing that they can:

- undertake measurements to an appropriate level of accuracy
- apply appropriate checks
- process and plot results

Evidence for the knowledge and/or skills for this Outcome will be provided on a sample basis. In any assessment of this Outcome, a minimum of **four out of five** knowledge and/or skills items should be sampled. In order to ensure that candidates will not be able to foresee which items they will be questioned on, a different sample of knowledge and/or skills items is required each time the outcome is assessed. Candidates must provide a satisfactory response in regard to all four knowledge and/or skills items.

Evidence should be generated in supervised conditions with candidates working in groups to undertake the fieldwork and individual candidates processing the derived data. Assessment should be conducted under open book conditions on a continuous basis.

Assessment guidelines

Where group work is involved, each candidate must participate in each aspect of the practical fieldwork required, exhibiting the required level of competence.

The assessment for this outcome might be combined with those for Outcomes 2 and 4 of this Unit.

Outcome 4

Set out basic construction works in line and level

Knowledge and/or skills

- Determination of setting out data
- Setting out points in plan
- Setting out levels for construction
- Checking methods

Evidence Requirements

Candidates will need to provide evidence to demonstrate their knowledge and/or skills by showing that they can:

- select appropriate methods for setting out purposes
- set out points to an acceptable level of accuracy
- apply appropriate checks

Evidence for the knowledge and/or skills for this Outcome will be provided on a sample basis. In any assessment of this Outcome, a minimum of **three out of four** knowledge and/or skills items should be sampled. In order to ensure that candidates will not be able to foresee which items they will be questioned on, a different sample of knowledge and/or skills items is required each time the outcome is assessed. Candidates must provide a satisfactory response in regard to all three knowledge and/or skills items.

Evidence should be generated in supervised conditions with candidates working in groups to undertake the fieldwork and individual candidates processing the derived data. Assessment should be conducted under open book conditions on a continuous basis.

Assessment guidelines

Where group work is involved, each candidate must participate in each aspect of the practical fieldwork required, exhibiting the required level of competence.

The assessment for this Outcome might be combined with those for Outcomes 2 and 3 of this Unit.

Administrative Information

Unit code: HR48 47

Unit title: Construction Site Surveying A

Superclass category: TC

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SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of SQA Advanced Qualifications.

FURTHER INFORMATION: Call SQA's Customer Contact Centre on 44 (0) 141 500 5030 or 0345 279 1000. Alternatively, complete our Centre Feedback Form.

SQA Advanced Unit specification: support notes

Unit title: Construction Site Surveying A

This part of the Unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

Guidance on the content and context for this Unit

This Unit provides the candidate with the knowledge and skills to carry out basic land surveying practice, by introducing the candidate to key aspects of: information gathering from existing plans; the use of a range of standard land surveying equipment; and the calculation of plan making and setting out data. Attention should be paid in the delivery of this Unit to the content of other related units in the programme. In particular, it should be noted that candidates in some programmes would be progressing to the unit entitled Construction Site Surveying B.

Recommended class time allocations to each outcome are given as guidance towards the depth of treatment that might be applied to each topic. This guidance has been used in the design of the assessment exemplar material for this Unit.

1 Information from plans to determine co-ordinates, distances, gradients, bearings and areas (9 hours)

Ordnance Survey (OS) co-ordinates and level*:* origin and orientation of OS national grid; OS and other datums; derivation of co-ordinates from plans; standard symbols; paper and electronic media.

Map and plan scales: the meaning of scale; available OS plan scales; suitable scales for construction survey plans.

Local co-ordinates and levels: site grids and appropriate deviations from OS levelling datum.

Partial co-ordinates: definitions of partial eastings and northings; relationship to total co-ordinates distances and bearings.

Distances and bearings: calculation of distances from end co-ordinates; whole circle and other expressions of bearing; determination of bearings from co-ordinates and vice-versa.

Regular and irregular areas: calculation of areas enclosed by straight lines (counting squares, triangles, by co-ordinates); planimeter; trapezium rule; Simpson's rule.

2 Levelling survey, contours, sections and volumes (13 hours)

OS and temporary benchmarks: purpose; recognition of OS benchmarks; suitable location for temporary benchmarks; expected accuracy.

Rise and fall method: procedures (including safety criteria); booking; change points; backsights, foresights and intermediate sights; sources of error.

Collimation method: procedures (including safety criteria); booking; change points; backsights, foresights and intermediate sights; sources of error.

Booking checks: arithmetic checks on the booking of levelling data; recognition of error.

Contouring and sections: definition of contours; interpolation and plotting of contours from level data; profiles; cross-sections; formation width and cross-sectional area.

Regular and irregular volumes: common shapes; calculation from spot height data; mean area rule; trapezoidal rule; Simpson's rule.

3 Measurement of angles and distances for survey purposes. (10 hours)

Theodolite use: angular scales; selection of suitable stations (including safety criteria); measurement of vertical angles; measurement of horizontal angles; booking of angular measurements; expected accuracy.

Distance measurements: measurement by tape; optical measurement; electromagnetic distance measurement; horizontal, vertical and slope distances; expected accuracies.

Linear tape survey: choice of survey lines; offsets; booking procedures; expected accuracies; temp and tape tension.

Checking methods: error sources; check lines in tape surveys; angular checks; repetition.

Plotting results to scale: plotting methods for angular and distance surveys; suitable scales; paper and electronic media.

4 Setting out basic construction works in line and level (8 hours)

Determination of setting out data: compilation of co-ordinate data or angle and distance data for setting out construction components in plan; compilation of levelling data for setting out components such as drains or road levels.

Setting out points in plan: methods of fixing orientation and distance to acceptable accuracy; marking of points for construction control.

Setting out levels for construction: erection of profiles at suitable height above finished level.

Checking methods: checking as work proceeds; final checks on position and level.

Guidance on the delivery and assessment of this Unit

This Unit provides the candidate with the knowledge and understanding of the basic processes in land surveying for construction purposes. Attention should be paid in the delivery of this Unit to the content of the other units in the programme(s), especially those related to measurement and, in particular, Construction Site Surveying B.

The opportunity to provide evidence of the achievement of a range of key skills will feature strongly in both formative and summative assessments. Since this Unit links with others in the built environment and civil engineering programmes, it should be studied in the first year of a two-year programme. Case studies could usefully be employed to illustrate the practical working context of the material delivered. This might involve practitioners to deal with some aspects of the content or site visits where these are possible. In addition, where the centre has access to land surveying software, this might be used to allow a broader application of the concepts.

Candidates will work in groups for the fieldwork sections of this Unit but would normally work individually in other parts of the Unit. Candidates should be encouraged to participate in discussion in relation to their own studies or experiences. Assessment may be formative and summative and both may feature as part of the process. Although assessment must be focussed on the individual achievement of each candidate, group work will contribute as appropriate. Integrative project work might assist in linking this Unit with other related units. Appropriate attention must be given to health and safety arrangements in relation to the topics covered.

The volume of evidence required for each outcome should take into account the overall number of assessments being contemplated within this Unit and the design of the overall delivery programme. In designing the assessment instrument(s) opportunities should be taken to generate appropriate evidence to contribute to the development of core skills elements.

Where available, evidence from the workplace can also be incorporated to enhance the learning outcomes, provided that such evidence is appropriate and authenticated as the candidate's own work.

Opportunities for developing Core Skills

Opportunities for the development of Core Skills at the output level are more fully identified in the Core Skills Signposting Guide. The grid below is indicative of the opportunities for core skills development within this Unit.

Core Skill	Outcome 1	Outcome 2	Outcome 3	Outcome 4
1 Communication				
Reading				
Writing		3	3	3
Oral		3	3	3
2 Numeracy				
Using Number	3	3	3	3
Using Graphical Information	3	3	3	3
3 IT				
Using Information Technology				
4 Problem Solving				
Critical Thinking		3	3	3
Planning and Organising		3	3	3
Reviewing and Evaluating				
5 Working with Others		3	3	3

Open learning

Where appropriate materials exist, this Unit could be delivered by distance learning, which may incorporate some degree of online support. However, with regard to assessment, planning would be required by the centre concerned to ensure the sufficiency and authenticity of candidate evidence. Arrangements would need to be put in place to ensure that assessments were conducted under controlled supervised conditions.

As a result of the practical nature of much of this Unit, it may not be suitable for open learning.

Equality and inclusion

This unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on our website www.sqa.org.uk/assessmentarrangements.

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4 Set out basic construction works in line and level.

Evidence that you can satisfy the knowledge and skill elements of this Unit will be obtained by assessment in controlled supervised conditions in an open book context (Outcome 1) and from fieldwork with individual processing of information (Outcomes 2, 3 and 4).