SQA Advanced Unit Specification

General information for centres

Unit title: Construction Site Surveying B

Unit code: HR59 47

Unit purpose: This Unit is designed to develop candidate knowledge and skills in the techniques traverse surveying for control purposes, the compilation of detail surveys, and the setting out of curves in the horizontal and vertical planes.

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

1 Carry out a traverse survey and calculate co-ordinates from the results.
2 Carry out a total station detail survey and derive a computer plot of the results.
3 Set out horizontal and vertical curves.

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:

Core Skills: There are opportunities to develop the Core Skills of Communication, Numeracy, IT, 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 of learning outcomes 1 and 2 is on the basis of practical work and the subsequent calculation of results and the plotting of data. The assessment of learning outcome 3 involves the compilation of setting out data and its subsequent use in practical fieldwork. Under these circumstances, the fieldwork for the surveys and for the setting out will be done in groups and each candidate will be expected to contribute to all the major components of this. In the calculation of results and compilation of setting out data, candidates should work 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

Unit title: Construction Site Surveying B

Unit code: HR59 47

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 and 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 a traverse survey and calculate co-ordinates from the results

Knowledge and/or skills

- Location of control points
- Observation of traverse angles
- Observation of distances
- Calculation of traverse co-ordinates
- Expected accuracy
- Production of scale drawing

Evidence Requirements

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

- observe the required traverse data to an acceptable level of accuracy
- calculate the co-ordinates (3D) of the traverse stations
- plot a scale drawing of the traverse plan

Evidence for the knowledge and/or skills for this outcome will **NOT** be provided on a sample basis. Candidates must provide a satisfactory response in regard to all the 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

Where group work is involved, each candidate must participate in each aspect of the practical fieldwork required, exhibiting the required level of competence. Calculation of the traverse and the production of the scale drawing must be done by individual candidates.

The assessment for this outcome might be combined with that for Outcome 2 in the Unit.

Outcome 2

Carry out a total station detail survey and derive a computer plot of the results

Knowledge and/or skills

- Planning the survey
- Data recording
- Data transfer
- Data editing
- Detail and contour plotting
- Plot editing

Evidence Requirements

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

- carry out a total station detail survey
- manage the handling of computerised survey data
- produce a detailed and contoured drawing of the survey

Evidence for the knowledge and/or skills for this outcome will **NOT** be provided on a sample basis. Candidates must provide a satisfactory response in regard to all the knowledge and/or skills items.

Evidence should be generated through assessment undertaken in controlled supervised conditions. Assessment should be conducted under open book conditions. Where group work is involved, each candidate must participate in each aspect of the practical fieldwork required, exhibiting the required level of competence.

Evidence should be generated in supervised conditions with candidates working in groups to undertake the fieldwork and individual candidates processing parts of 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. Each candidate must contribute to all aspects of the data processing and the production of the plan.

The assessment for this outcome might be combined with those for Outcome 1 of this Unit.

Outcome 3

Set out horizontal and vertical curves

Knowledge and/or skills

- Circular horizontal curve equations
- Parabolic vertical curve equations
- Setting out data
- Practice of setting our horizontal curve
- Practice of setting out vertical curve

Evidence Requirements

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

- calculate the setting out data for circular horizontal and parabolic vertical curves
- set out a horizontal circular curve
- set out a parabolic vertical curve

Evidence for the knowledge and/or skills for this outcome will **NOT** be provided on a sample basis. Candidates must provide a satisfactory response in regard to all the knowledge and/or skills items.

Evidence should be generated through assessment undertaken in controlled supervised conditions. Assessment should be conducted under open book conditions. Where group work is involved, each candidate must participate in each aspect of the practical fieldwork required, exhibiting the required level of competence.

Evidence should be generated in supervised conditions with candidates working individually to produce the necessary setting out data and in groups to undertake the fieldwork. 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.

Administrative Information

Unit code: HR59 47

Unit title: Construction Site Surveying B

Superclass category: TC

Date of publication: August 2017

Version: 01

Source: SQA

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 B

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 a detail and contour survey using total station equipment, deriving a computerised plot of the results based on the setting up of a three-dimensionally co-ordinated control traverse. In addition, the candidate will be introduced to the principles and practice of curve ranging. 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 will have the knowledge and skills base derived from Construction Site Surveying A or an equivalent.

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 Carry out a traverse survey and calculate co-ordinates from the results (12 hours).

Location of control points*:* selection of stations (minimum 4) to enable intervisibility, maximisation of detail data collection and safe working.

Observation of traverse angles: setting up instruments and targets; right-turn and left-turn observations; booking of angles; derivation of internal angles.

Observation of distances: horizontal distances between stations; vertical distances between stations.

Calculation of traverse co-ordinates: adjustment of angular misclosure; calculation of bearings; adjustment of partial co-ordinate misclosure; derivation of station co-ordinates (3D).

Expected accuracy: standard angular and distance accuracy for instruments in use; identification of mistakes.

Production of scale drawing: manual or computer plot of station co-ordinates.

2 Carry out a total station detail survey and derive a computer plot of the results (16 hours).

Planning the survey: determining extent of detail from each control station; location of extra control points required; recording control point information.

Data recording: spot height data at appropriate spacing; detail data in appropriate order using standard coding; co-ordination of extra control points.

Data transfer: managing the transfer of data from instrument recording to computer database; merging group databases into survey database.

Data editing: correcting errors in the data; resolving discrepancies between group databases.

Detail and contour plotting: detail plotting using standard symbols; use of computer routines to derive contour lines at appropriate spacing.

Plot editing: editing of detail plot to ensure completeness; adjustment of contours by insertion of breaklines if necessary; addition of text to drawing.

3 Set out horizontal and vertical curves (12 hours).

Circular horizontal curve equations: radius; curvature; deflection angles; arc lengths; chord lengths.

Parabolic vertical curve equations: gradients; curve length; sign conventions; calculation of levels.

Setting out data: derivation of data (usually deflection angles and chord lengths) for horizontal curve; derivation of data (usually distance and level) for vertical curve.

Practice of setting out horizontal curve: location of points in plan at appropriate distances apart; accuracy expected.

Practice of setting out vertical curve: placing of profiles at appropriate distances apart along given vertical curve; accuracy expected.

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), particularly Construction Site Surveying A, from which it follows on.

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.

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 Sign Posting Guide'. The grid below is indicative of the opportunities for core skills development within this Unit.

Core Skill	Outcome 1	Outcome 2	Outcome 3
1 Communication			
Reading			
Writing			
Oral	3	3	3
2 Numeracy			
Using Number	3		3
Using Graphical Information	3	3	
3 IT			
Using Information Technology		3	
4 Problem Solving			
Critical Thinking	3	3	3
Planning and Organising	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.

General information for candidates

Unit title: Construction Site Surveying B

On completion of the Unit you should be able to:

1 Carry out a traverse survey and calculate co-ordinates from the results.
2 Carry out a total station detail survey and derive a computer plot of the results.
3 Set out horizontal and vertical curves.

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 and from fieldwork with structured group and individual processing of information.