

-SQA- SCOTTISH QUALIFICATIONS AUTHORITY

HIGHER NATIONAL UNIT SPECIFICATION

GENERAL INFORMATION

-Unit Number- 4420684

-Superclass- TC

-Title- **CONSTRUCTION PRACTICE: PRACTICAL**
SURVEYING AND LEVELLING

-DESCRIPTION-

GENERAL COMPETENCE FOR UNIT: Applying the principles of surveying and levelling for setting out small construction works.

OUTCOMES

1. interpret technical information;
2. apply principles of linear surveying;
3. apply principles of levelling;
4. set up and use a theodolite;
5. set out small construction projects.

CREDIT VALUE: 1 HN Credit

ACCESS STATEMENT: This unit forms part of the Higher National Certificate in Construction Practice, details of which are given in the Support Notes under Progression. Access to this unit is at the discretion of the centre although the candidate would normally be receiving complementary industrial experience in an area of construction and have successfully completed an Advanced Certificate in one of the following:

Brickwork
Carpentry and Joinery
Painting and Decorating
Plasterwork
Roof Slating and Tiling
Stonemasonry

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Hanover House, 24 Douglas Street, Glasgow G2 7NQ.

Additional copies of this unit may be purchased from SQA (Sales and Despatch
section). At the time of publication, the cost is £1.50 (minimum order £5).

HIGHER NATIONAL UNIT SPECIFICATION**STATEMENT OF STANDARDS****UNIT NUMBER:** 4420684**UNIT TITLE:** CONSTRUCTION PRACTICE: PRACTICAL
SURVEYING AND LEVELLING

Acceptable performance in this unit will be the satisfactory achievement of the standards set out in this part of the specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

OUTCOME**1. INTERPRET TECHNICAL INFORMATION****PERFORMANCE CRITERIA**

- (a) Ordnance Survey plans are clearly understood.
- (b) Plans of construction sites are clearly understood.
- (c) Ordnance Survey notations and symbols are identified correctly.
- (d) Oral or written instructions are correctly interpreted.

RANGE STATEMENT

Information sources: Ordnance Survey plans; location plans; site plans; scales; symbols; abbreviations; oral and written instructions.

EVIDENCE REQUIREMENTS

Evidence of competence in:

- (i) interpreting technical information on Ordnance Survey plans;
- (ii) interpreting technical information on site and location plans.

Oral or written evidence of knowledge and understanding of:

- (i) types and purpose of information sources;
- (ii) recognised symbols and abbreviations;
- (iii) the purpose of OBMs and TBMs;
- (iv) scaled measurements;
- (v) coordinated information.

All the performance criteria must be met and all items in the range statement covered.

OUTCOME

2. APPLY PRINCIPLES OF LINEAR SURVEYING

PERFORMANCE CRITERIA

- (a) The principles of linear surveying are correctly applied.
- (b) The uses of linear measuring equipment are correctly demonstrated.
- (c) Results entered in field book are clear and correct.
- (d) Appropriate checks are applied to guarantee the accuracy of the work.
- (e) Oral or written instructions are correctly interpreted and implemented.
- (f) The use and care of equipment comply with recognised practices.

RANGE STATEMENT

Information sources: site plan; dimensions; scales; symbols; abbreviations.

Equipment: measuring tapes; ranging poles; ancillary equipment.

Processes: measuring; lining in; recording; drying and storing equipment.

EVIDENCE REQUIREMENTS

Evidence of competence under working conditions in:

- (i) carrying out a linear survey;
- (ii) logging the results.

Oral or written evidence of knowledge and understanding of:

- (i) types and purpose of information sources;
- (ii) method and purpose of checking tape length against standard;
- (iii) possible causes of error in taking linear measurements;
- (iv) the factors to be considered in selecting a base line;
- (v) methods of negotiating obstacles;
- (vi) simple trilateration measurements.

All the performance criteria must be met and all items in the range statement covered.

OUTCOME**3. APPLY PRINCIPLES OF LEVELLING****PERFORMANCE CRITERIA**

- (a) The principles of levelling are correctly applied.
- (b) The correct procedures for setting up a levelling instrument are adopted.
- (c) Terminology applied to levelling operations is used correctly.
- (d) Results of levelling survey are booked correctly using:
 - (i) rise and fall booking system;
 - (ii) height of collimation booking system.

RANGE STATEMENT

Information sources: site plan; dimensions; scales; symbols; abbreviations.

Equipment: dumpy level; tilting and automatic levels; levelling staves; levelling notebooks.

Processes: practical levelling from and to benchmarks; simple transfer of levels; simple setting out.

EVIDENCE REQUIREMENTS

Evidence of competence under working conditions in:

- (i) carrying out a levelling survey;
- (ii) logging the results.

Oral or written evidence of knowledge and understanding of:

- (i) type and purpose of information sources;
- (ii) temporary adjustment procedures;
- (iii) principal causes of error in levelling;
- (iv) various terms used in levelling;
- (v) booking systems;
- (vi) procedures used to set out levels.

All the performance criteria must be met and all items in the range statement covered.

OUTCOME**4. SET UP AND USE A THEODOLITE****PERFORMANCE CRITERIA**

- (a) The correct procedures for setting up a theodolite are adopted.
- (b) Angles are measured correctly on the horizontal plane.
- (c) Angles are measured correctly on the vertical plane.
- (d) Right angles are correctly set out.
- (e) Angles are booked in accordance with recognised practice.

RANGE STATEMENT

Information sources: manufacturers' literature; technical data; oral or written instructions.

Equipment: theodolite; tripod.

Processes: measuring horizontal angles; measuring vertical angles.

EVIDENCE REQUIREMENTS

Evidence of competence under working conditions in:

- (i) setting-up a theodolite;
- (ii) measuring horizontal and vertical angles;
- (iii) setting out a right angle.

Oral or written evidence of knowledge and understanding of:

- (i) type and purpose of information sources;
- (ii) methods of temporary adjustment;
- (iii) the main causes of error in the measurement of angles;
- (iv) simple booking procedures;
- (v) setting out procedures;
- (vi) necessity of checking observations 'face left' and 'face right'.

All the performance criteria must be met and all items in the range statement covered.

OUTCOME**5. SET OUT SMALL CONSTRUCTION PROJECTS****PERFORMANCE CRITERIA**

- (a) Projects are correctly set out using established procedures.
- (b) Corners and profile boards are set out to a stated degree of accuracy.
- (c) Sight rails are set out accurately.
- (d) Terminology applied to setting out is used correctly.

RANGE STATEMENT

Information sources: site plan; detailed plan; scales; symbols; abbreviations.

Projects: drain runs; column bases; L-shaped building.

Equipment: levelling instrument; measuring tapes; ancillary equipment.

EVIDENCE REQUIREMENTS

Evidence of competence under working conditions in:

- (i) setting out an L-shaped building;
- (ii) setting out column bases;
- (iii) setting out a drain track.

Oral or written evidence of knowledge and understanding of:

- (i) type and purpose of information sources;
- (ii) Pythagoras' theorem and the 3:4:5 ratio;
- (iii) methods of checking accuracy in setting out;
- (iv) problems of sloping ground;
- (v) levelling of drainage runs;
- (vi) determination of gradients;
- (vii) use of sight rails and travellers.

All the performance criteria must be met and all items in the range statement covered.

MERIT A candidate who achieves all performance criteria for all outcomes will be awarded a pass. A pass with merit may be awarded to a candidate who consistently demonstrates some or all of the following:

- (a) level of accuracy;
- (b) logical presentation of work;
- (c) ideas proficiently communicated;
- (d) good motivation in carrying out assignments.

ASSESSMENT

In order to achieve this unit, candidates are required to present sufficient evidence that they have met all the performance criteria for each outcome within the range specified. Details of these requirements are given for each outcome. The assessment instruments used should follow the general guidance offered by the SQA assessment model and an integrative approach to assessment is encouraged. (See references at the end of support notes).

Accurate records should be made of the assessment instruments used showing how evidence is generated for each outcome and giving marking schemes and/or checklists, etc. Records of candidates' achievements should also be kept. These records will be required for external verification.

SPECIAL NEEDS

Proposals to modify outcomes, range statements or agreed assessment arrangements should be discussed in the first place with the external verifier.

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HIGHER NATIONAL UNIT SPECIFICATION**SUPPORT NOTES**

UNIT NUMBER: 4420684

UNIT TITLE: CONSTRUCTION PRACTICE: PRACTICAL
SURVEYING AND LEVELLING

SUPPORT NOTES: This part of the unit specification is offered as guidance. None of the sections of the support notes is mandatory.

NOTIONAL DESIGN LENGTH: SQA allocates a notional design length to a unit on the basis of the time estimated for achievement of the stated standards by a candidate whose starting point is as described in the access statement. The notional design length for this unit is 40 hours. The use of notional design length for programme design and timetabling is advisory only.

CONTENT/CONTEXT The candidate should achieve the level of competence of someone who is in a position of responsibility on a construction site involved in setting-out small buildings and drainage excavations and charged with the effective operation of work activities.

Corresponding to Outcomes 1-5:

1. This outcome should provide candidates with a clear understanding of drawings and other technical data related to practical surveying and levelling.
2. This outcome should provide candidates with a clear understanding of the information and equipment required to carry out linear surveys and the skills required to do so.
3. This outcome should provide candidates with a clear understanding of the information and equipment required to carry out levelling surveys and the skills required to do so.
4. The use of the theodolite for measuring horizontal and vertical angles should be developed with the candidate being made aware of the restricted use of this instrument in this unit.
5. Skills should be developed along established procedures to set out small projects with the emphasis being placed on accuracy. The methods of double checking setting-out should also be adopted.

The candidate should be made aware that the setting-out of column bases would normally be carried out by a site engineer using a theodolite which is beyond the scope of this unit.

APPROACHES TO GENERATING EVIDENCE Most of this unit will be completed in a situation with candidates carrying out the procedures outlined in the outcomes. The teaching should be based on recognised practices of surveying and levelling with practical tasks restricted to small groups.

ASSESSMENT PROCEDURES Centres may use the Instruments of Assessment which are considered by tutors/trainers to be the most appropriate. Examples of Instruments of Assessment which could be used are as follows:

Outcome 1 The candidate could be set ten structured questions on the interpretation of technical information: Ordnance survey plans - five questions; site plans - five questions.

Satisfactory achievement of this outcome will be based on the candidate producing at least seven correct responses.

Outcome 2 The candidate could be set a practical survey with a checklist being devised for the practical activities.

It is suggested that an assignment is used here. The candidate could be directed to carry out a linear survey of a small area, applying all necessary checks to guarantee its accuracy and produce a simple plan from the results.

Satisfactory achievement of this outcome would be based on the accuracy achieved on the finished survey.

Outcome 3 The candidate could be set a small levelling assignment to level from a known bench mark and set out a level on site then close on a second known bench mark using at least four settings of the level.

A checklist could be devised establishing acceptable responses.

Outcome 4 It is suggested that an assignment is used here. The candidate could be directed to set up a theodolite accurately over a known station, sight a second known station and turn off an accurate right angle, checking the work on both faces.

A checklist could be devised establishing acceptable responses.

Outcome 5 It is suggested that an assignment is used here. The candidate could be directed to demonstrate the ability to set up an L-shaped building, a small drainage run and a line of column bases to predetermined positions on a site.

A checklist could be devised establishing acceptable responses.

PROGRESSION This unit forms part of the framework for the second stage of the HNC in Construction Practice. (The first stage is the framework for the Advanced Certificate in Construction Practice).

Each unit is a separate part of the framework of units for the award and units are not necessarily taken in a prescribed order, although there is a logical sequence to the acquisition of the skills and knowledge concerned.

To gain the award, the candidate must successfully complete all of the following units:

4420634	Construction Practice: Site Preparation and External Works (x 0.5)
4420644	Construction Practice: Substructure (x 0.5)
4420654	Construction Practice: Superstructure (x 2.0)
4420664	Construction Practice: Materials, Components and Finishes
4420674	Construction Practice: Services
4420694	Construction Practice: Measurement and Taking Off (x 0.5)
4420704	Construction Practice: Supervision
4460043	Construction Site Safety
4420503	Construction Technology 1
4420513	Construction Technology 2
4420473	Building Materials: Selection and Deterioration (x 1.5)
4420684	Construction Practice: Practical Surveying and Levelling
4420033	Building Site Administration
6450743	Standard Forms of Construction Contracts

REFERENCES

1. Guide to unit writing.
2. For a fuller discussion on assessment issues, please refer to SQA's Guide to Assessment.
3. Information for centres on SQA's operating procedures is contained in SQA's Guide to Procedures.
4. For details of other SQA publications, please consult SQA's publications list.

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