

## SQA Advanced Unit Specification

### General information for centres

**Unit title:** Traffic Engineering

**Unit code:** HR5H 48

**Unit purpose:** This Unit was designed to develop candidate knowledge and skills in traffic survey work, traffic planning procedures, traffic management techniques and the analysis of intersections.

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

- 1 Describe traffic surveys and apply statistical principles to survey data.
- 2 Explain standard traffic planning procedures in relation to capacity, safety and environmental quality.
- 3 Apply traffic management techniques.
- 4 Describe and analyse common intersections based on given data.

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

*\*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:** It is recommended that candidates undertaking this Unit should have prior knowledge and skills as evidenced by the completion of the following unit: Civil Engineering Specialisms; or equivalent prior knowledge and/or experience.

**Core Skills:** There are opportunities to develop the Core Skills of Numeracy, and Problem Solving 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.

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**Assessment:** It is possible to assess candidates on an individual outcome basis, by combinations of outcomes, or by a single holistic assessment encompassing all outcomes. Assessment should be conducted under supervised conditions. The assessment(s) should consist of an appropriate balance of restricted response and structured questions. If a single assessment covering all outcomes is used, it should not exceed three hours in duration. 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 knowledge and skills 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 8.

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### SQA Advanced Unit specification: statement of standards

**Unit title:** Traffic Engineering

**Unit code:** HR5H 48

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

Describe traffic surveys and apply statistical principles to survey data

##### Knowledge and/or skills

- ◆ Types of traffic survey
- ◆ Traffic survey equipment
- ◆ Traffic survey procedures
- ◆ Traffic survey data
- ◆ Traffic survey data analysis
- ◆ Before-and-after data

##### Evidence Requirements

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

- ◆ explain appropriate traffic survey requirements and/or procedures
- ◆ draw statistical conclusions from traffic survey 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. 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

The assessment for this Outcome might be combined with those for some or all of the other outcomes in the Unit.

## **Outcome 2**

Explain standard traffic planning procedures in relation to capacity, safety and environmental quality

### **Knowledge and/or skills**

- ◆ The roads hierarchy
- ◆ Speed/Flow/Concentration relationships
- ◆ Traffic models
- ◆ Policy frameworks
- ◆ Provision for non-motorised traffic

### **Evidence Requirements**

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

- ◆ identify appropriate criteria in traffic planning
- ◆ explain the problems and characteristics of traffic planning

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. 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**

The assessment for this Outcome might be combined with those for some or all of the other outcomes in the Unit.

## **Outcome 3**

Apply traffic management techniques

### **Knowledge and/or skills**

- ◆ Road signs and markings
- ◆ Traffic calming
- ◆ Bus priority
- ◆ Pricing controls
- ◆ Telematic methods

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### Evidence Requirements

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

- ◆ identify the need for traffic management
- ◆ evaluate application, advantages and shortcomings of selected traffic management measures

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. 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

The assessment for this Outcome might be combined with those for some or all of the other outcomes in the Unit.

## Outcome 4

Describe and analyse common intersections based on given data

### Knowledge and/or skills

- ◆ Intersection and conflict types
- ◆ Major/minor junctions
- ◆ Roundabouts
- ◆ Traffic signal control
- ◆ Grade separation

### Evidence Requirements

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

- ◆ explain advantages, shortcomings and design criteria of different intersection types
- ◆ analyse the geometry and capacity of selected intersection(s)

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. 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

The assessment for this Outcome might be combined with those for some or all of the other outcomes in the Unit.

## **SQA Advanced Unit Specification**

### **Administrative Information**

<b>Unit code:</b>	HR5H 48
<b>Unit title:</b>	Traffic Engineering
<b>Superclass category:</b>	TL
<b>Date of publication:</b>	August 2017
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## **SQA Advanced Unit specification: support notes**

### **Unit title: Traffic Engineering**

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 and analyse basic traffic surveys. It introduces some of the key aspects of traffic planning and management practices and seeks to provide the candidate with the knowledge to address traffic intersection capacity and design. 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 some traffic survey elements are featured in the unit entitled Civil Engineering Specialisms. There is also a related unit in Highway Engineering.

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 Traffic surveys and analysis of data. (10 hours)**

**Types of traffic survey:** manual and automatic; flow surveys; speed surveys; origin and destination surveys; parking surveys; household surveys; accident surveys; environmental surveys.

**Traffic survey equipment:** survey sheets; electronic fieldbooks; detection devices; roadside traffic counters; speedometers; video filming equipment; video image processing.

**Traffic survey procedures:** manual and automatic methods; personnel and equipment requirements and location; surveyor and public safety.

**Traffic survey data:** data handling and presentation; types of data (frequency, spatial and time-series).

**Traffic survey data analysis:** appropriate statistical analysis of flow, speed and accident data.

**Before-and-after data:** determination of significant change (or otherwise) following implementation of traffic control or accident remediation measures.

#### **2 Traffic planning procedures in relation to capacity, safety and environmental quality (7 hours)**

**The roads hierarchy:** definitions; rural roads hierarchy and management; urban roads and streets hierarchy with principal functions.

**Speed/Flow/Concentration relationships:** standard relationships as applied to various road types.

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**Traffic models:** types of planning models; traffic and environmental relationships.

**Policy frameworks:** legislative framework; national and local objectives; parking policy.

**Provision for non-motorised traffic:** pedestrian and cyclist facilities; vehicle/pedestrian-shared surfaces.

### 3 Traffic management techniques (7 hours).

**Road signs and markings:** function of signs and markings; types of road sign; location of signs; types of markings.

**Traffic calming:** objectives; humps, cushions and tables; chicanes and build-outs; surfacings; area-wide schemes.

**Bus priority:** objectives; with-flow bus lanes; contraflow bus lanes; signal priority; turning exemptions; bus-only streets.

**Pricing controls:** objectives; toll systems; congestion charging; user-charging.

**Telematic methods:** vehicle and incident detection; information and messaging systems; traffic control systems.

### 4 Intersections (16 hours)

**Intersection and conflict types:** different types of vehicle/vehicle and vehicle/pedestrian conflict at junctions; relative advantages of junction types.

**Major/minor junctions:** types of layout and control; geometric and traffic parameters in capacity determination; capacity relationships and analysis.

**Roundabouts:** types of roundabout; suitable sites; standard layouts; geometric and traffic parameters in capacity determination; capacity relationships and analysis.

**Traffic signal control:** design and saturation flows; lost times; determination of optimum cycle time and signal settings; queuing and delay; layout of signal-controlled junctions.

**Grade separation:** partial and complete grade separation; application of different types; function, layout and capacity.



## **Guidance on the delivery and assessment of this Unit**

Since this Unit relies in part on the candidate's knowledge from a previously completed unit, the unit should be studied in the second 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 road junction design software, this might be used to allow a broader application of the concepts.

Candidates would normally work individually but should be encouraged to participate in group work and 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 may 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.

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

## **SQA Advanced Unit Specification**

### **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.

### **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](http://www.sqa.org.uk/assessmentarrangements).

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### **General information for candidates**

#### **Unit title:** Traffic Engineering

On completion of this Unit you should be able to:

- 1 Describe traffic surveys and apply statistical principles to survey data.
- 2 Explain standard traffic planning procedures in relation to capacity, safety and environmental quality.
- 3 Apply traffic management techniques.
- 4 Describe and analyse common intersections based on given data.

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.