



National Unit specification: general information

Unit title: Wastewater Treatment (SCQF Level 6)

Unit code: H003 12

Superclass: TL

Publication date: November 2011

Source: Scottish Qualifications Authority

Version: 01

Summary

The purpose of this Unit is to provide candidates with an opportunity to develop an understanding of the processes within the operations and business of the water industry which are used to treat and dispose of wastewater.

This is a mandatory Unit within the National Progression Award in Water Operations at SCQF level 6.

This Unit is intended for candidates who have recently joined the water industry. The Unit is also suitable for candidates who have joined the water industry as an apprentice or at a similar level.

Outcomes

- 1 Demonstrate knowledge of screening and disintegration systems used in wastewater treatment.
- 2 Demonstrate knowledge of the principles of flow measurement, storm water treatment and disposal.
- 3 Demonstrate knowledge of grit removal systems used in wastewater treatment.
- 4 Demonstrate knowledge of primary sedimentation tanks used in wastewater treatment.
- 5 Demonstrate knowledge of biological treatment, biological filtration and activated sludge systems in wastewater treatment.
- 6 Demonstrate knowledge of secondary settlement tanks and related tertiary treatment systems used in wastewater treatment.

Recommended entry

Entry is at the discretion of the centre. Candidates doing this Unit do not need any prior knowledge or experience of the water industry. Good skills in communication and ICT will be an advantage.

General information (cont)

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Credit points and level

2 credit(s) at SCQF level 6 (12 SCQF credit points at SCQF level 6*)

**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 Access 1 to Doctorates.*

Core Skills

Opportunities to develop aspects of Core Skills are highlighted in the support notes of this Unit specification.

There is no automatic certification of Core Skills or Core Skill component in this Unit.

National Unit specification: statement of standards

Unit title: Wastewater Treatment (SCQF Level 6)

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

Outcome 1

Demonstrate knowledge of screening and disintegration systems used in wastewater treatment.

Performance Criteria

- (a) Correctly explain the function and operation of screening systems used in wastewater treatment.
- (b) Correctly explain the function and operation of disintegration systems used in wastewater treatment.

Outcome 2

Demonstrate knowledge of the principles of flow measurement, storm water treatment and disposal.

Performance Criteria

- (a) Describe briefly how flow can be measured in open channels using flumes and weirs.
- (b) Describe briefly how flow can be measured in pipes.
- (c) Explain briefly how storm overflows can be justified.
- (d) Correctly explain the construction and principles of operation of one common type of storm overflow.
- (e) Explain briefly the decision process in relation to the setting of storm overflows.

Outcome 3

Demonstrate knowledge of grit removal systems used in wastewater treatment.

Performance Criteria

- (a) State the critical velocity required in grit removal systems and why it is necessary to maintain this.
- (b) Identify the key elements of the construction of a grit removal system.
- (c) Adequately explain how a grit removal system operates.
- (d) Outline briefly how grit is removed and disposed of.

National Unit specification: statement of standards (cont)

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Outcome 4

Demonstrate knowledge of primary sedimentation tanks used in wastewater treatment.

Performance Criteria

- (a) Describe the common features of primary sedimentation tanks.
- (b) Describe by means of a simple sketch any one of vertical, horizontal or radial flow primary sedimentation tanks.
- (c) Describe briefly how sludge in primary sedimentation tanks is commonly collected and removed from the tanks.

Outcome 5

Demonstrate knowledge of biological treatment, biological filtration and activated sludge systems in wastewater treatment.

Performance Criteria

- (a) Describe the basic principles of biological treatment.
- (b) Describe briefly the general construction, and layout of biological filters.
- (c) State briefly the key factors of biological filters that have to be controlled and which can affect their performance.
- (d) Describe the basic principles and methods used in the treatment & disposal of sludge from wastewater treatment processes.
- (e) Describe briefly the general construction, and layout of activated sludge systems.
- (f) State briefly the key factors of activated sludge systems that have to be controlled and which can affect their performance.
- (g) State briefly the advantages and disadvantages of biological filters and of activated sludge systems.

Outcome 6

Demonstrate knowledge of secondary settlement tanks and related tertiary treatment systems used in wastewater treatments.

Performance Criteria

- (a) Correctly describe the key features and principles of operation of the two main types of secondary settlement tanks.
- (b) Explain in general terms why there are differences in the de-sludging regime of final settlement tanks and humus tanks.
- (c) State correctly the main reasons why tertiary treatment is required.
- (d) Correctly describe at least two methods of tertiary treatment.

National Unit specification: statement of standards (cont)

Unit title: Wastewater Treatment (SCQF Level 6)

Evidence Requirements for this Unit

Evidence is required to demonstrate that candidates have achieved all Outcomes and Performance Criteria.

This Unit can be assessed by individual Outcome assessment or by adopting a holistic approach to assessment.

Written, oral, diagrammatical or electronic form of evidence should be produced to demonstrate that the candidate has achieved all of the Outcomes and Performance Criteria. The evidence should be produced under supervised conditions to a given brief.

Outcome 1 — Written and/or Oral Evidence

The evidence for this Outcome must be obtained under controlled, supervised conditions. The assessment will be closed-book.

Candidates will need to provide evidence to demonstrate their knowledge of two screening and disintegration systems used in wastewater treatments that will include:

- ◆ the function and operation of either a hand raked or a mechanical bar screen used in wastewater treatment
- ◆ the function and operation of either a band screen or a drum screen used in wastewater treatment
- ◆ general layout of systems used for gross solids treatment using disintegrators or comminutors
- ◆ the routes and methods used for final disposal of gross solids

Outcome 2 — Written and/or Oral Evidence

The evidence for this Outcome must be obtained under controlled, supervised conditions. The assessment will be closed-book.

Candidates will need to provide evidence to demonstrate their knowledge of the principles of flow measurement, storm water treatment and disposal that will include:

- ◆ flow measurement in open channels using flumes and weirs
- ◆ flow measurement in pipes
- ◆ rationale for storm overflows and settings
- ◆ types of storm overflow

National Unit specification: statement of standards (cont)

Unit title: Wastewater Treatment (SCQF Level 6)

Outcome 3 — Written and/or Oral Evidence

The evidence for this Outcome must be obtained under controlled, supervised conditions. The assessment will be closed-book.

Candidates will need to provide evidence to demonstrate their knowledge of grit removal systems used in wastewater treatments that will include:

- ◆ critical velocity of grit removal systems.
- ◆ types of grit removal systems, any one from:
 - parabolic type grit channels
 - vortex type grit channels
 - detritor type grit channels
- ◆ grit removal and final disposal

Outcome 4 — Written and/or Oral Evidence

The evidence for this Outcome must be obtained under controlled, supervised conditions. The assessment will be closed-book.

Candidates will need to provide evidence to demonstrate their knowledge of biological filtration and activated sludge systems in wastewater treatment that will include:

- ◆ a minimum of four common key features of primary sedimentation tanks based on any one of the following:
 - vertical, horizontal and radial flow primary sedimentation tanks
- ◆ arrangements for sludge collection and removal, at least three of each.

Outcome 5 — Written and/or Oral Evidence

The evidence for this Outcome must be obtained under controlled, supervised conditions. The assessment will be closed-book.

Candidates will need to provide evidence to demonstrate their knowledge of biological filtration and activated sludge systems in wastewater treatment that will include:

- ◆ the basic principles of biological treatment
- ◆ construction, layout and key features of at least two biological filters
- ◆ a minimum of five factors affecting performance of biological filters
- ◆ treatment and disposal of sludge from wastewater treatment processes
 - main sources of sludge produced at a wastewater treatment works
 - basic principles of consolidation and de-watering
 - principles of anaerobic sludge digestion
 - final disposal of sludges
- ◆ construction, layout and key features of at least two activated sludge systems
- ◆ a minimum of four factors affecting performance of activated sludge systems
- ◆ advantages and disadvantages of biological filters, minimum of three each
- ◆ advantages and disadvantages of activated sludge systems, minimum of three each

National Unit specification: statement of standards (cont)

Unit title: Wastewater Treatment (SCQF Level 6)

Outcome 6 — Written and/or Oral Evidence

The evidence for this Outcome must be obtained under controlled, supervised conditions. The assessment will be closed-book.

Candidates will need to provide evidence to demonstrate their knowledge of secondary settlement tanks and related tertiary treatment systems used in wastewater treatments that will include:

- ◆ five common key features of secondary settlement tanks based on vertical, horizontal and radial flow secondary settlement tanks
- ◆ the main differences in de-sludging of final settlement tanks and humus tanks
- ◆ a minimum of three reasons for tertiary treatment
- ◆ at least two methods of tertiary treatment from the following range:
 - lagoons and clarification ponds
 - sand filters
 - grass plots and reed beds

National Unit specification: support notes

Unit title: Wastewater Treatment (SCQF Level 6)

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 80 hours.

Guidance on the content and context for this Unit

This is a mandatory Unit within the National Progression Award in Water Operations at SCQF level 6.

This Unit is intended to give candidates background information on the principles and processes used by water undertakings to treat and dispose of wastewater.

The emphasis is on providing an understanding of the reasons why wastewater needs to be treated and the relationship between the treatment and the environmental impact of effluent disposal.

The industry has developed, with Energy and Utility Skills and industry regulators, a framework based on National Occupational Standards for 'competent operators' which all UK water undertakers have agreed to adopt. This Unit has been developed to align with specific element of these National Occupational Standards:

- ◆ **Treatment Process Operations**
 - monitor and maintain the quality of treatment processes
 - receive, store and handle processing chemicals
 - receive and store sludge for processing
 - on-site sampling
 - on-site storage
 - samples and measurements for quality assurance

- ◆ **Sewerage Maintenance**
 - restore sewers and ancillaries to an appropriate condition
 - carry out inspection and operational maintenance of sewers and ancillaries
 - prepare resources and segregate the area of site

- ◆ **Maintain Water Supply Network**
 - carry out operational planning for network activities
 - develop an understanding of techniques for minimum disruption of the distribution network during operational activities
 - maintain budgetary and regulatory requirements for network activities

- ◆ **Water Fittings Regulations/Byelaws/Enforcement**
 - secure compliance with water fittings regulations/byelaw

National Unit specification: support notes (cont)

Unit title: Wastewater Treatment (SCQF Level 6)

Guidance on learning and teaching approaches for this Unit

It is intended that this qualification should be delivered as much as possible with reference to actual industry practices and processes. With this in mind, it would be beneficial if candidates had access to water industry installations and systems.

Tutorial delivery methods include a variety of teaching methods which will enhance the learning experience, including face to face tutorials, field trips, group discussion and networking candidate's industrial experience and expertise, visiting industry specialists, work related project activities, etc.

It is recommended that a structured site visit to a wastewater treatment works should form part of the learning and teaching approach to this Unit.

Guidance on approaches to assessment for this Unit

Outcomes could be assessed by candidates producing a report combined with a closed-book assessment. Questions used to elicit candidate response could take the form of an appropriate balance of questioning techniques such as:

- ◆ multiple choice
- ◆ restricted response
- ◆ extended response

The evidence for the reports should, if possible, be drawn from a wastewater treatment process that the candidate has personal experience of. However if for practical reasons the candidate has no experience, evidence could be provided by means of a desk top study and/or literature search and review of an appropriate location as long as the Evidence Requirements are met.

As part of the NPA in Water Operations at SCQF level 6, this Unit can be assessed as part of an integrated examination in the form of an extended response paper and/or an assignment on a given topic.

Opportunities for the use of e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or social software. Centres which wish to use e-assessment must ensure that the national standard is applied to all candidate evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. Further advice is available in *SQA Guidelines on Online Assessment for Further Education (AA1641, March 2003)*, *SQA Guidelines on e-assessment for Schools (BD2625, June 2005)*.

National Unit specification: support notes (cont)

Unit title: Wastewater Treatment (SCQF Level 6)

Opportunities for developing Core Skills

In this Unit candidates will develop aspects of Core Skills at SCQF level 6 through contextualised activities designed to support the candidate develop their knowledge and understanding of the key aspects of the processes within the operations and business of the water industry which are used to treat and dispose waste water.

Development of Core Skills elements will take place through learning and teaching activities as well as through practical activities which candidates will be involved in planning and delivering and reflection of such activities.

In this Unit candidates will, through development of their knowledge and understanding of the key aspects of the water supply, be provided the opportunity to develop the following Core Skills:

Communication — both Oral and Written

- ◆ small group working, discussion
- ◆ written reports

Problem Solving — Critical Thinking; Planning and Organising; Reviewing and Evaluating

- ◆ apply knowledge and understanding to a series of research based assignments
- ◆ completing assignments through effective planning and organising within groups and individually
- ◆ self evaluation

ICT — Accessing and Processing Information

- ◆ conducting research
- ◆ using technology to present findings

Numeracy — Using Graphical Information; Using Number

- ◆ applying graphical and numerical skills to analyse wastewater treatment processes

Working with Others

- ◆ applying scientific experiments in the analysis of wastewater, designed to reinforce the candidates learning through group activities
- ◆ participating in group activities and discussion

Disabled candidates and/or those with additional support needs

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering whether any reasonable adjustments may be required. Further advice can be found on our website www.sqa.org.uk/assessmentarrangements

History of changes to Unit

Version	Description of change	Date

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