



Higher National Unit Specification

General information

Unit title: Water Operations: Operation and Maintenance of the Sewerage Network (SCQF level 7)

Unit code: H7FG 34

Superclass: TL

Publication date: July 2014

Source: Scottish Qualifications Authority

Version: 01

Unit purpose:

This Unit is suitable for learners who wish to understand the principles and processes involved and who are currently employed in, or who are seeking employment in the water industry or a related role.

The Unit is designed to give you a good understanding of the principles and practices involved in the operation and maintenance of the sewerage network. It will increase the understanding of existing or potential Water Industry Managers, Team Leaders and Technicians. It will enable Water Industry employees in non-operational posts to be able to move into or fulfil more operational related roles.

Successful learners will develop the skills and knowledge associated with, and required for, roles in operation and maintenance of the sewerage network.

On successful completion of the Unit the learner will be able to:

- 1 Explain the operation and maintenance of sewerage systems and related installations.
- 2 Explain the design and construction of sewerage systems.
- 3 Evaluate the contractual framework used by the water industry for the operation and maintenance of sewerage system.
- 4 Explain the impact and control of trade effluent.

Credit points and level

1.5 Higher National Unit credits at SCQF level 7: (12 SCQF credit points at SCQF level 7)

Higher National Unit Specification: General information (cont)

Recommended entry to the Unit

It would be beneficial, though not essential, for learners to have some Water Industry experience in Waste Water Treatment or Waste Water Networks.

Core Skills

Opportunities to develop aspects of Core Skills are highlighted in the Support Notes for this Unit specification.

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

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.

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.

Higher National Unit specification: statement of standards

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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.

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. Learners should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Explain the operation and maintenance of sewerage systems and related installations.

Knowledge and/or Skills

- ◆ Types of sewer systems commonly found in UK
- ◆ The nature of sewage and industrial effluents
- ◆ The key instruments and provisions of the legal and statutory framework
- ◆ Key structural maintenance techniques and responsibilities
- ◆ Customer service in relation to water companies sewerage operations
- ◆ The environmental impact of a water companies sewerage operations,
- ◆ Remedial measures relating to failures and non-compliance
- ◆ Major incident procedures in relation flooding and pollution
- ◆ Health and safety consideration relating to sewerage operations

Evidence Requirements

Learners are required to provide written or oral recorded evidence. The evidence will be generated under supervised conditions in response to an assignment or unseen questions. Evidence through presentation will be supported by evidence of research and planning.

Evidence for the Knowledge and/or Skills in this Outcome will be generated through sampling. Each learner will need to provide evidence to demonstrate they can examine six of the nine Knowledge and/or Skills.

Any sampling process must be 'unseen' by the learner before the assessment. That is, learners are expected to fully prepare the range of knowledge and skills and not be able to predict a chosen sample.

Higher National Unit specification: statement of standards (cont)

Unit title: Water Operations: Operation and Maintenance of the Sewerage Network (SCQF level 7)

Subject to the sampling described above, learners will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ identify types of sewer and key components of a sewerage system.
- ◆ discuss the nature and components of sewage.
- ◆ identify the key provisions of legislation and regulations affecting Operation and Maintenance of the Sewerage Network operations with regards.
- ◆ describe the methods used in the operation and maintenance of sewerage networks.
- ◆ evaluate condition monitoring processes employed in the Water Industry.
- ◆ identify common failure modes of the sewerage network.
- ◆ explain remedial measures related to the above failures.
- ◆ identify key steps in relation to emergency procedures for sewer flooding and pollution incidents.
- ◆ discuss all of the above in relation to customer service relating to a sewerage undertakers responsibilities.
- ◆ describe safe operation procedures for working on and in sewerage systems.

Outcome 2

Explain the design and construction of sewerage systems.

Knowledge and/or Skills

- ◆ Procedures used to control and monitor sewerage system performance
- ◆ Analytical methods and techniques in the hydraulic design of sewerage systems
- ◆ Economic and Planning Aspects of sewer construction projects
- ◆ Standard design details, including materials, labour and financial resources, required of:
 - manholes
 - combined sewer overflows
 - pumping stations
- ◆ Construction activities, constraints and guides including:
 - Planning
 - Funding
 - Construction Design and Management Regulations
 - Relevant Sewers for Adoption Guide (Note England and Wales, Scotland and Northern Ireland each have different guides)
 - Civil Engineering Specification for the Water Industry The Sewerage Rehabilitation Manual
- ◆ Connections to sewers

Higher National Unit specification: statement of standards (cont)

Unit title: Water Operations: Operation and Maintenance of the Sewerage Network (SCQF level 7)

Evidence Requirements

Learners are required to provide written or oral recorded evidence. The evidence will be generated under supervised conditions in response to an assignment or unseen questions. Evidence through presentation will be supported by evidence of research and planning.

Evidence for the Knowledge and/or Skills in this Outcome will be generated through sampling. Each learner will need to provide evidence to demonstrate they can examine four of the six Knowledge and/or Skills.

Subject to the sampling described above, learners will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ discuss flow measurement and modelling techniques.
- ◆ apply analytical methods and techniques in the hydraulic design of sewerage systems.
- ◆ produce drawings for sewer components demonstrating various construction techniques.
- ◆ describe the design, planning and construction processes for of the Sewerage Network.
- ◆ explain the sewer adoption process and procedures.
- ◆ evaluate pump performance using appropriate analytical methods.

Outcome 3

Evaluate the contractual framework used by the water Industry for the operation and maintenance of sewerage system.

Knowledge and/or Skills

- ◆ The contractual framework employed by sewerage undertakers and the supply chain in the Water Industry
- ◆ Performance measures in place relating to operation and management of the Sewerage Network
- ◆ Royal Institute of British Architects (RIBA) Plan of Work with regard to planning for Operation and Maintenance of the Sewerage Network construction to include specifications resources, budget and time constraints
- ◆ Measurements for estimates and payments including drawing up a bill of quantities

Higher National Unit specification: statement of standards (cont)

Unit title: Water Operations: Operation and Maintenance of the Sewerage Network (SCQF level 7)

Evidence Requirements

All Knowledge and/or Skills items in this Outcome must be assessed.

Learners are required to provide written or oral recorded evidence. The evidence will be generated under supervised conditions in response to an assignment or unseen questions. Evidence through presentation will be supported by evidence of research and planning.

Learners will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ evaluate with regard to customer service, regulatory compliance and adding value the types of contracts used by sewerage undertakers and the industry supply chain.
- ◆ explain the major categories of RIBA's Plan of Work with regard to planning for Operation and Maintenance of the Sewerage Network construction.
- ◆ discuss performance measures employed by sewerage undertakers to monitor contracts with its supply chain.
- ◆ explain the importance of the Standard Method of Measurement for Building Works.

Outcome 4

Explain the impact and control of trade effluent.

Knowledge and/or Skills

- ◆ Legislative and regulatory framework relating to trade effluent discharges to sewers
- ◆ Types of trade effluent and their environmental impact
- ◆ Monitoring and control of trade effluent discharges
- ◆ Commercial aspects of trade effluent treatment

Evidence Requirements

All Knowledge and/or Skills items in this Outcome must be assessed.

Learners are required to provide written or oral recorded evidence. The evidence will be generated under supervised conditions in response to an assignment or unseen questions. Evidence through presentation will be supported by evidence of research and planning.

Learners will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ describe types of trade effluent and their possible environmental impact.
- ◆ discuss the controls in place for trade effluent discharges.
- ◆ evaluate from an environmental and economic point of view the treatment and disposal of trade effluents.



Higher National Unit: Support Notes

Unit title: Water Operations: Operation and Maintenance of the Sewerage Network (SCQF level 7)

Unit Support Notes are offered as guidance and are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 60 hours.

Guidance on the content and context for this Unit

This Unit is designed to enable you to develop the skills and knowledge associated with the principles and processes commonly used in operation and maintenance of the Sewerage Network. It is suitable if you who wish to understand the principles and processes involved and are currently employed in, or are seeking employment in a water treatment environment or a related role. Ideally, whilst undertaking this Unit you will have access to Waste Water operational sites. If you don't have access yourself the centre delivering the Unit will, in most cases, be able to arrange site visits.

This Unit is likely to form part of a Group Award which is designed to increase the understanding of existing or potential Water Industry Team Leaders and Technicians or to enable Water Industry employees currently involved in other functions, to move into a more operational related role.

The emphasis should therefore be on ensuring that learners comprehend the principles behind the processes and build on the understanding from the previous Units and have a thorough understanding of how the processes work.

It is designed to give you a good understanding of the principles and practices involved in the Operation and Maintenance of the Sewerage Network.

There are four Outcomes in this Unit and these are outlined below.

Outcome 1: Explain the operation and maintenance of sewerage systems and related installations

For Outcome 1 you will cover, types of sewer systems, sewage pumping stations, sewer materials, ancillaries and elements of waste water network, the nature of sewage and industrial effluents, health and safety requirements, the legal and statutory framework, sewerage undertaker, adoption of sewers, public and private sewers, guaranteed standards of service, customer service, environmental impact and company responsibility in respect to discharges from the sewerage system, collection of data, planning, statutory maintenance obligations, maintenance techniques, inspection frequencies/prioritisation, sewer survey methods, structural maintenance, sewer structural condition/defects, connections to sewers, typical major incident procedures with a case study, rodents, confined space entry, telemetry used in sewerage risk assessments, coastal sewerage, sewage flooding, types of sewage pumping stations, systems used for the control and management of sewage pumping stations, analytical methods and techniques in the hydraulic design of sewage pumping stations, confined space entry, telemetry.

Higher National Unit: Support Notes (cont)

Unit title: Water Operations: Operation and Maintenance of the Sewerage Network (SCQF level 7)

Outcome 2: Explain the design and construction of sewerage systems.

For Outcome 2 you will cover measurement and calculations enabling you to design networks and components of networks, economic and planning aspects of sewer construction projects, transfer of private sewers, construction activities, construction Design and Management Regulations, Sewers for Adoption, Civil Engineering Specification for the Water Industry, The Sewerage Rehabilitation Manual, transfer of private sewers, the stages of arriving at investment policies and programmes, including: regulatory requirements, replacement need and corporate strategy.

Outcome 3: Evaluate the contractual framework used by the water industry for the operation and maintenance of sewerage system.

For Outcome 3 you will cover Budgets and financial monitoring, Contractual arrangements, Legal and Statutory Framework, Connections to sewers, Economic and Planning Aspects of sewer construction projects, Contractual arrangements, Legal interfaces, Sewers for Adoption, Civil Engineering Specification for the Water Industry, The Sewerage Rehabilitation Manual, Sewer cleansing and blockage removal, construction and design management (CDM) for waste water network systems, the sources of capital investment for sewerage network construction projects

Outcome 4: Explain the impact and control of trade effluent.

For Outcome 4 you will cover all aspects of trade effluent control, monitoring and investigating non-compliance.

Guidance on approaches to delivery of this Unit

The Unit should be delivered by a planned blend of class room based teaching and individual research. The individual research done by the learner should be directed and supported by tutors at the centre.

The course work to be used for the Unit should be introduced at an early stage and could be available and supported online.

Centres should facilitate and direct a varied approach to teaching and learning which could include group work, field trips and classroom activities. This is particularly important with students who don't have experience of this Unit subject at work. Centres should monitor and adjust the teaching approach to meet the needs of individuals or particular student groups who may have significantly different initial knowledge and experience.

Higher National Unit: Support Notes (cont)

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Guidance on approaches to assessment of this Unit

As an example, assessment for this Unit could be through an assignment which sets out a scenario for the learners to follow and which then requires them to apply their learning to a real life challenge. As an illustration the scenario could invite the learner say as a member of a capital investment project team to report on an investigation into and major upgrade of a drainage area. The details of which could be provided by the learner from a real example at work or if this is not possible by the assessor.

If the scenario, led by the assessor, ensures the students look at and report on two or more options to resolve the operational problem and then have to consider the consequences of changing conditions many of the learning Outcomes will be covered.

A particular challenge for a centre with this approach is to ensure the scenario sets out but also limits the work required. For example if for some particular installation final design figures are required the scenario should say so. If the scenario is asking for just draft design or sufficient detail for feasibility it should also say so.

With the above assignment example as the learner has freedom to select their own solution to a real or given problem it is likely that some Evidence Requirements will not be covered. If the assignment scenario is designed well the items not covered could then be readily assessed through unseen questions.

Centres will develop an assessment strategy which complies with SQA policies and guidelines and meets all learning Outcomes. Elements of individual Evidence Requirements may be sampled.

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. Learners should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

It is possible to assess learners 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 calculations and short written answers. If a single assessment covering all Outcomes is used, it should not exceed three hours in duration.

Centres are encouraged to design assessments that take a holistic approach with questions or assignments giving opportunity for learners to demonstrate evidence for two or more Outcomes at the same time.

Higher National Unit: Support Notes (cont)

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Opportunities for 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 learner evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. The most up-to-date guidance on the use of e-assessment to support SQA's qualifications is available at www.sqa.org.uk/e-assessment.

Opportunities for developing Core and other essential skills

There are opportunities to develop the Core Skills of *Communication, Information and Communication Technology (ICT)* and *Problem Solving* at SCQF level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

All Outcomes require learners to produce written and/or oral evidence which considers the effective treatment of waste water. If this evidence is presented in an appropriate format this may offer learners the opportunity to develop the written and/or oral component of the Core Skill *Communication* at SCQF level 6.

This Unit may also provide opportunities to develop the Core Skill *Information and Communication Technology* at SCQF level 6 as learners may utilise *Information and Communication Technology* to research and understand different water treatment processes. They may also use information technology to present information including tables, graphs and diagrammatical representations of treatment processes in their assignments for this Unit.

The Unit may also provide opportunities to develop the Core Skill *Problem Solving* in particular the Core Skill component of Critical Thinking at SCQF level 6. This can be shown through the learner dealing with a situation or issue where variables may be relatively complex. They can identify the variables and relationships between them. By evaluating the situation and potentially devising a new approach which may be justified.

History of changes to Unit

Version	Description of change	Date

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General information for learners

Unit title: Water Operations: Operation and Maintenance of the Sewerage Network (SCQF level 7)

This section will help you decide whether this is the Unit for you by explaining what the Unit is about, what you should know or be able to do before you start, what you will need to do during the Unit and opportunities for further learning and employment.

This Unit is intended to be delivered as part of the HNC Water Operations Qualification. It is designed to give you a good understanding of the principles and practices involved in the Operation and Maintenance of the Sewerage Network.

It is suitable if you wish to understand the principles and processes involved and are currently employed in, or are seeking employment in a water treatment environment or a related role. Ideally, whilst undertaking this Unit you will have access to Waste Water treatment sites.

The assessment for this Unit will be through well planned course work and structured assignments. The course work and assessment will give opportunities to develop the Core Skills of *Communication, Information and Communication Technology (ICT)* and *Problem Solving* at SCQF level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.