Higher National Unit specification

General information for centres

Unit title: Water Operations: Water Quality Management

Unit code: F53R 34

Unit purpose: This Unit is designed to enable the candidate to develop the skills and knowledge associated with Water Quality Management. It is suitable for candidates who wish to understand how drinking water and waste water quality is measured, how the legislative framework associated with the standards impacts on the Industry as a whole, and how compliance with the standards is monitored and enforced.

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

1 Explain the importance of quality control in Drinking Water and Wastewater operations.
2 Describe legislation and controls relevant to the quality of Drinking water and Waste Water.
3 Describe the significance of quality indicators for drinking water and waste water operations.
4 Describe how quality infringements of Drinking Water and Waste Water can occur and be remedied.

Credit points and level: 1.5 HN credit(s) at SCQF level 7: (12 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 Access 1 to Doctorates.*

Recommended prior knowledge and skills: Access to this Unit is at the discretion of the centre however, it would be beneficial though not essential if candidates had some Water Industry experience in such as Drinking Water Treatment, Waste Water Treatment or Networks.

Core Skills: There are opportunities to develop the written component of the Core Skill *Communication* at SCQF level 6, and the Core Skills *Information and Communication Technology* and *Problem Solving* at SCQF level 6 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.

General information for centres (cont)

Assessment: Outcomes 1 and 2 are assessed be a closed-book assessment that could be undertaken at a single assessment event. Outcome 3 and 4 could be undertaken as a single report that meets the Evidence Requirements for both Outcomes.

Higher National Unit specification: statement of standards

Unit title: Water Operations: Water Quality Management

Unit code: F53R 34

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.

Outcome 1

Explain the importance of quality control in Drinking Water and Wastewater operations

Knowledge and/or Skills

- Quality Control
- Drinking Water Operations
- Waste Water Operations
- Drinking water Definitions
- Waste Water Definitions
- Organisations

Evidence Requirements

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

- describe the general principles of Quality Control. The description must include at least one definition of quality and; at least two approaches to quality and; at least four principles.
- describe how drinking water and waste water operations are affected by Quality Control measures. The description must include at least four areas affected by Quality Control requirements.
- explain why Quality Control is important to the Drinking Water and Waste Water sectors of the Water Industry. The explanation must include at least three reasons for Drinking Water and three reasons for waste water sectors.
- explain the different definitions of quality applied within the Drinking Water and Waste Water sector and the different ways in which quality may be assessed within the both sectors. The explanation must identify the organisations responsible for defining quality and the organisations responsible for assessing quality in the Drinking Water and Waste water sectors.

Assessment must be conducted under closed-book conditions.

Assessment Guidelines

Assessment for this Outcome is by closed-book assessment and questions used to elicit candidate response could take the form of an appropriate balance of multiple choice and restricted response designed to meet the Evidence Requirements.

Higher National Unit specification: statement of standards (cont)

Unit title: Water Operations: Water Quality Management

Outcome 2

Describe legislation and controls relevant to the quality of Drinking Water and Waste Water

Knowledge and/or Skills

- Current Drinking Water Legislation
- Current Waste Water Legislation
- Current Drinking Water Directives
- Current Waste Water Directives
- Water Undertakings
- Control and Enforcement Organisations
- Current Water Quality standards

Evidence Requirements

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

- outline at least three Principles of relevant and current Drinking Water and Waste Water legislation and Directives
- describe at least three responsibilities imposed on Water Undertakings by those specific sections of current Drinking Water and Waste Water legislation and Directives which relate to Quality.
- describe the role and function of current control and enforcement organisations responsible for monitoring Drinking Water and Waste Water Quality
- describe how the current Drinking Water and Waste Water Quality standards are enforced

Assessment must be conducted under closed-book conditions.

Assessment Guidelines

Assessment for this Outcome could be a closed-book end of Unit assessment and questions used to elicit candidate response could take the form of an appropriate balance of multiple choice and restricted response type designed to meet the Evidence Requirements

Higher National Unit specification: statement of standards (cont)

Unit title: Water Operations: Water Quality Management

Outcome 3

Describe the significance of quality indicators for drinking water and waste water operations

Knowledge and/or Skills

- Drinking Water Quality Indicators
- Waste Water Quality Indicators
- Drinking Water Treatment Processes
- Distribution Systems
- Permitted values
- Waste Water Treatment Processes
- Sewerage Systems

Evidence Requirements

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

- describe the main indicators of Drinking Water Quality and the significance of the permitted values. The description must include at least four indicators; a description of the importance of each indicator including why it is considered a main indicator; as well as the permitted values.
- describe how the four indicators described in the previous Evidence Requirement affect Drinking Water Treatment processes and distribution systems. The description must include how these processes and systems are managed and controlled.
- describe the main indicators of Waste Water Quality and the significance of the permitted values The description must include at least four indicators, a description of the importance of the indicator including why it is considered a main indicator as well as the permitted values.
- describe how the indicators described in the previous Evidence Requirement affect Waste Water Treatment processes and Sewerage Systems. The description must include how these processes and systems are managed and controlled.

Assessment Guidelines

For this Outcome, it is suggested that the assessment could consist of a report and that the assessment could be combined with that of Outcome 4 of this Unit.

The evidence for the report could be drawn from an employer's current or historical practice in Drinking Water Quality and Waste Water Quality Control.

Higher National Unit specification: statement of standards (cont)

Unit title: Water Operations: Water Quality Management

Outcome 4

Describe how quality infringements of Drinking Water and Waste Water can occur and how they can be remedied

Knowledge and/or Skills

- Quality Infringements
- Naturally occurring Infringements
- Water and Wastewater Operations Infringements.
- Drinking water remedies and solutions
- Waste water remedies and solutions

Evidence Requirements

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

- explain the common infringements of quality in Drinking Water and Waste Water operations that can occur. The explanation must include at least two naturally arising infringements and at least two infringements that may arise as a consequence of Drinking Water operations and at least two infringements that may arise as a consequence of Waste water operations.
- for both drinking Water and Waste Water operations, describe the actions, remedies, solutions and courses of action that can be applied in the event of infringements. The description must include managerial, staff development, procedural and process actions.

Assessment Guidelines

For this Outcome, it is suggested that the assessment could consist of a report and the assessment could be combined with that of Outcome 3 of this Unit.

The evidence for the report could if possible be drawn from an employer's current or historical practice in Drinking Water Quality and Waste Water Quality Control.

Administrative Information

Unit code: F53R 34

Unit title: Water Operations: Water Quality Management

Superclass category: TL

Original date of publication: August 2008

Version: 02

History of changes:

Version	Description of change	Date
02	Credit value changed from 1 HN credit to 1.5 HN credits	25/05/10

Source: SQA

SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of Higher National qualifications.

Additional copies of this Unit specification can be purchased from the Scottish Qualifications Authority. Please contact the Customer Contact Centre for further details, telephone 0845 279 1000.

Higher National Unit specification: support notes

Unit title: Water Operations: Water Quality Management

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 60 hours.

Guidance on the content and context for this Unit

This Unit is designed to give the candidates a sound underpinning knowledge of the principles of Drinking Water and Waste Water Quality Management to facilitate them to function or develop as Water Industry Team Leaders and Technicians, or to enable them to progress to more advanced study.

This Unit is intended as part of the framework for the HNC in Water Operations but it may be suitable for inclusion in other HNC/HND awards. The Unit is suitable for those candidates who are currently employed in, or who are seeking employment in a relevant Water Industry environment or a related role.

The guidance below provides some guidance as to what may be covered in each Outcome and provides recommended time allocations to each Outcome as guidance towards the depth of treatment that might be applied to each topic.

Outcome 1 Explain the importance of quality control in Drinking Water and Wastewater operations **(15 hours)**

The general principles of Quality Control should be covered.

The main areas of Drinking Water and Waste Water operations affected by Quality Controls could include:

- at the point of contact with the customer including indirect or internal customers. This could include eg farmers disposal of sewage sludge to the land, Environmental Agency or the Scottish Environment Protection Agency, the Aquatic environment and Colleagues (to ensure instructions, procedures, specifications, etc are in line with quality).
- at the point of contact with suppliers of goods and services and the quality of goods and services supplied to it.
- in the marketing and promotion of a quality product and services supplied by the Water Undertaking.
- in the nature and source of all raw material(s) (Note: Raw water and Wastewater are raw materials for their respective processes).
- at all stages in the manufacturing process. Raw water is abstracted from the environment to manufacture drinking water and from sewage, sewage effluent is manufactured which is much less polluting. Incorrect quality at any stage in the manufacturing produces the ‘wrong’ quality of the final product. (ie Drinking Water and sewage effluent).
- at the point of contact with indirect or internal customers which will include:

Higher National Unit specification: support notes (cont)

Unit title: Water Operations: Water Quality Management

Why Quality Controls are so important to the Drinking Water and Waste Water sectors of the Water Industry could include:

- 'living up' to the promotional literature and image
- 'living up' to customer's expectations
- avoid the financial cost of replacing the defective products and/or services.
- avoiding the cost of 'reworking' rejected materials
- reducing the manufacture of waste products such as wash water from Rapid Gravity Filters or chemical sludges from Water Treatment Works
- minimising the cost of all waste ie scrap materials, wasted effort by people etc
- the legislative requirements of the Water Quality Regulations or the Urban Wastewater Directive

The various ways in which Quality within the Drinking Water and Waste Water sectors of the Water Industry Water is defined and the range of organisations and bodies responsible for defining it should be covered. This could start of with a definition from the dictionary before considering the following:

- the domestic consumer provides a definition of quality by the way they react to the goods and services provided.
- the commercial customer also provides a definition of quality by the way they react to the goods and services provided. They also have a specific contract with the water undertaking which may have a quality aspect specified.
- Public Health specialists, Environmental Health Officers, and **The Environmental Agency (EA)** and the **Scottish Environmental Protection Agency (SEPA)** provide definitions of quality in relation to their particular areas of responsibility.
- EC and UK Law by way of The EC Directive on Drinking Water; The Urban wastewater Directive; The Control of Pollution Act; The Rivers Prevention of Pollution Act; The Water Quality Regulations etc all provide a definition of quality by specifying standards of service or defining maximum levels of substances etc.

The various ways in which Quality within the Drinking Water and Waste Water sectors of the Water Industry Water is assessed and the range of organisations and bodies responsible for assessing I should be covered. This could be done by identifying the available measuring 'tools' or standards some of which are laid down by the Law or by Regulations, others are defined by the Water Authorities themselves eg response time to complaints or queries. Delivery could also include:

- by sampling or auditing using the measuring 'tools'.
- by mutual agreement with the customer via consumer consultative committees or when resolving disputes or complaints.
- by comparison with competitor's product(s). The legal obligation to produce Annual Reports on Quality that allows comparisons between **Water Undertakings** as a means of assessing quality performance enables this process.
- accepted sets of quality standard(s) such as the Water Quality Regulations as again via Annual Reports anyone can compare the actual quality performance against that demanded by the Law.

- by arbitration ie the involvement of a third party such as the Law or the Drinking Water Inspectorate (DWI) or the Water Industry Commission for Scotland (WIC).
- by the customer selecting a competitor for their Water/Wastewater Supply, Treatment, Disposal and services.

Outcome 2 Describe legislation and controls relevant to the quality of Drinking Water and Waste Water **(15 hours)**

This Outcome should outline current Drinking Water and Waste Water legislation and Directives which affect Drinking Water and Waste Water Operations. This could include: the EC Directive on Drinking Water; The Urban wastewater Directive; The Control of Pollution Act; The Rivers Prevention of Pollution Act; The Water Quality Regulations; The Water Framework Directive and any other relevant legislation at the time of delivery.

The delivery should focus on those sections of the relevant and current Drinking Water and Waste Water legislation and Directives which specifically relate to Quality and could include Controlled activity Regulations and Water Quality Regulations. The responsibilities imposed on Water Undertakings by these specific sections relating to the measurement of quality; the need to report on performance related to Quality and to provide information to public on quality could be included.

The bodies and organisations currently responsible for monitoring Drinking Water and Waste Water Quality and their function should be covered. This could include: Public Health specialists; Environmental Health Officers; **The Environmental Agency (EA);Scottish Environmental Protection Agency (SEPA);** DWI; and the WIC.

The Systems and Mechanisms for the Control and Enforcement of Drinking Water and Waste Water Quality standards could include formal sampling, prosecution and penalties.

Outcome 3 Describe the significance of quality indicators for drinking water and waste water operations **(15 hours)**

The main indicators of Drinking Water Quality and the significance of the permitted values. The indicators could include Colour, clarity, taste, odour, chemical and microbiological.

How these indicators affect the operation of Drinking Water Treatment processes and distribution systems eg selection of type of process used, throughput, sludge production, etc.

The main indicators of Waste Water Quality and the significance of the permitted values.
eg Biological Oxygen Demand (BOD), Suspended Solids (SS), Chemical Oxygen Demand (COD), Solvents, Heavy Metals could be included.

How these indicators affect Waste Water Treatment processes and Sewerage Systems. The Loadings, Oxygenation, sludge production, type of process selected etc.

Higher National Unit specification: support notes (cont)

Unit title: Water Operations: Water Quality Management

Outcome 4 Describe how quality infringements of Drinking Water and Waste Water can occur and how they can be remedied **(15 hours)**

Common infringements of quality in Drinking Water and Waste Water Quality eg those that can arise naturally and those which can originate as a consequence of the activities of the Water and Wastewater Undertakers should be covered.

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For both drinking Water and Waste Water, the common actions, remedies, solutions and courses of action that can be applied in the event of infringements are to be included.

Guidance on the delivery and assessment of this Unit

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 candidates comprehend the principles of Drinking Water and Waste Water Quality Management and have a thorough understanding of how it works in practice.

It is recommended that evidence for all Outcomes is achieved through well planned course work structured reports and site visit(s) preferably accompanied by a course tutor or someone with knowledge of the content of this Unit. Delivery could be enhanced by the sampling of a water source Where samples are taken prior to the analysis of the samples for common water and Waste Water.

Quality parameters, candidates could be asked to predict the results using their existing knowledge and observation of the terrain etc surrounding the water source. After analysis candidates could be asked to comment on the significance of the results, and asked to provide an explanation of the analysis both if they were as predicted or if there was a discrepancy. This could help to develop candidates understanding of quality issues and the approaches taken within the industry.

Assessments for Outcome 1 and Outcome 2 must be carried out under closed-book conditions and could be combined as one single assessment event. The assessment for Outcome 3 and 4 could be combined as a single report. The evidence for the report could be drawn from an employer's current or historical practice in Drinking Water Quality and Waste Water Quality Control.

However if for practical reasons the candidate cannot access employer sites and data, evidence could be provided by means of a desk top study and/or literature search and review of appropriate material which might include, employers future or proposed procedures or strategies in relation to Drinking Water and Waste Water Quality Control, water treatment, or the investigation and resolution of relevant current or historical quality problems.

Higher National Unit specification: support notes (cont)

Unit title: Water Operations: Water Quality Management

Opportunities for developing Core Skills

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

Outcomes 3 and 4 may provide the opportunity to develop the written component of the Core Skill *Communication* at SCQF level 6 should the candidate present their findings in the form of a written report.

Outcomes 2, 3 and 4 may provide the opportunity to develop the Core Skill *Information and Communication Technology* at SCQF level 6 as candidates may have to use information technology resources to research, prepare and present information for throughout the delivery of all three Outcomes in preparing and submitting the report for the assessment of Outcomes 3 and 4.

The assessment for Outcomes 3 and 4 could involve the historical and/or current practices within an organisation and candidates may be asked to consider the application of these practices and any issues arising with a view to making recommendations. Should this be the case candidates may have the opportunity to develop all three components of the Core Skill *Problem Solving*.

Open learning

This course may be delivered in a flexible/distance/open learning format with a limited physical tutor support.

To deliver in this manner a considerable amount of independent study will be required. Candidates are expected to relate the knowledge gained to real events and it is recommended that the candidate should make at least one site visit to a Water Source. If possible a water sample could be taken provided that candidates have access to a laboratory or some other means of carrying out the analysis to enhance their learning. Preferably candidates should be accompanied by a course tutor or someone with knowledge of the content of this Unit, in order that the visit can be appropriately structured and the significance of the results of the analysis adequately explored. The sample could be used to highlight issues in this Unit.

Centres should ensure that a comprehensive set of learning materials is available and delivered to the candidate in a time scale appropriate to the learning and assessment.

Given that appropriate materials exist, this Unit could be delivered by distance learning which may incorporate some degree of tutor support or on-line support using a VLE.

However with regard to assessment, planning would be required to by the centre concerned to ensure the sufficiency and authenticity of candidate evidence.

Arrangements would be required to be put in place to ensure that assessments were conducted under controlled, supervised conditions.

Higher National Unit specification: support notes (cont)

Unit title: Water Operations: Water Quality Management

Candidates with disabilities and/or additional support needs

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering alternative Outcomes for Units. Further advice can be found in the SQA document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs* **(www.sqa.org.uk)**.

General information for candidates

Unit title: Water Operations: Water Quality Management

Whilst this Unit may be taken as a stand alone Unit it is intended to be delivered as part of the HNC Water Operations. It is designed to give a good understanding of the principles and practices involved in Waste Water Quality Management and should be of particular interest should you be employed within the Water Industry. Ideally, you should be employed within the water industry or be able to access water industry sites to assist you in your study of this Unit.

The Unit s suitable for you should you wish to develop your understanding of how drinking water and waste water quality is measured, how the legislative framework associated with the standards impacts on the Industry as a whole, and how compliance with the standards is monitored and enforced.

There are four Outcomes in this Unit:

1 Explain the importance of quality in the context of Drinking Water and Wastewater operations. This Outcome will introduce you to the definitions of quality used in the industry and the different ways in which water quality may be assesses.
2 Outline legislation and controls relevant to the quality of Drinking water and Waste Water operations. In addition, this Unit covers the organisations currently responsible for the control and enforcement of quality within both sectors.
3 Describe the significance of the main quality indicators for Drinking Water and Waste Water and how they are used to measure, relevant to quality, the performance of Public Water Businesses.
4 Describe how quality infringements of Drinking Water and Waste Water can occur and be remedied. This will include common strategies, remedies, solutions and courses of action that can be applied in the event of Waste Water Quality Infringements.

Assessments for Outcomes 1 and 2 will be in the form of closed-book assessments. Outcomes 3 and 4 may be in the form of a report. Your tutor will advise as to how the centre will assess the Unit.

There are opportunities to develop the written component of the Core Skill *Communication* at SCQF level 6, and the Core Skills *Information and Communication Technology* and P*roblem Solving* at SCQF level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.