



Higher National Unit specification

General information for centres

Unit title: Water Operations: Materials and Components

Unit code: F53L 34

Unit purpose: This Unit is designed to enable candidates to develop the skills and knowledge associated with the principal materials and components used within the water industry.

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

- 1 Describe the properties and uses of Water Industry engineering materials.
- 2 Describe the process of material selection for a given network installation system within the water industry.
- 3 Explain the function of components used within the water industry.
- 4 Explain corrosion prevention methods for the water industry.
- 5 Describe the materials and components for installation and rehabilitation of wastewater collection systems.

Credit points and level: 1.5 HN credits 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: It is recommended that candidates have *Communication* and *Numeracy* skills to SCQF level 4 or equivalent.

Core Skills: There are opportunities to develop the written component of the Core Skills of *Communication* and the Core Skill *Problem Solving* to SCQF level 6 and the Core Skill *Information and Communication Technology* at SCQF level 5, 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.

Assessment: Outcome 1 and Outcome 5 are assessed through closed-book assessment whilst Outcomes 2–4 could be assessed by a combination of closed-book and a report. The closed-book assessment could take the form of a single closed-book end of Unit assessment.

Higher National Unit specification: statement of standards

Unit title: Water Operations: Materials and Components

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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

Describe the properties and uses of Water Industry engineering materials

Knowledge and/or Skills

- ◆ Historical development
- ◆ Metals and plastics
- ◆ Concrete Properties
- ◆ Trench support systems

Evidence Requirements

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

- ◆ the historical development of the use of metal and plastic in the water industry. The description must include the properties of the materials and the improvements created by the use of these materials; at least four developments must be covered.
- ◆ the properties of a range of metal and plastic materials used in the water industry. The description must include at least two metal and two plastic materials.
- ◆ at least three properties of concrete and two uses of concrete within the water industry. The description must include the constituents of concrete, testing for workability and strength and at least two example of where concrete may be best used.
- ◆ at least two materials used for two trench support systems in use in the water industry. The description must include at least two advantages and two disadvantages for each material.

The assessment must be conducted under closed-book conditions.

Assessment Guidelines

For this Outcome, it is suggested that the assessment could be combined with other Outcomes as part of a single closed-book end of Unit assessment.

Higher National Unit specification: statement of standards (cont)

Unit title: Water Operations: Materials and Components

Outcome 2

Describe the process of material selection for a given network installation system within the water industry

Knowledge and/or Skills

- ◆ Network Installation system
- ◆ Materials selection process

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can for a given network installation:

- ◆ select materials. The selection must include at least two metal and two plastic materials and be supported by reasons.
- ◆ describe the material selection process for a given network installation system. The description must include the requirements of the network installation system and how different materials may be selected because of their suitability to the given system.

Assessment Guidelines

For this Outcome, it is suggested that the assessment could consist of a report which might be combined with that of Outcomes 3 and 4 and as a part of a closed-book assessment for the whole Unit. Questions used to elicit candidate response could take the form of an appropriate balance of multiple choice and restricted response type.

Ideally, candidates should produce the practical; components in the context of their workplace. However, if for practical reasons the candidate cannot access suitable materials, evidence could be provided by means of a desk top study and/or literature search and review of an appropriate development as long as the Evidence Requirements are met.

Higher National Unit specification: statement of standards (cont)

Unit title: Water Operations: Materials and Components

Outcome 3

Explain the function of components used within the water industry

Knowledge and/or Skills

- ◆ Components
- ◆ Interrelationships
- ◆ Maintenance

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by submitting a report which should explain:

- ◆ the function of at least six components used within the water industry.
- ◆ how components are interrelated in a water distribution system giving an example of at least three such interrelationships.
- the maintenance requirements of components in a water distribution system. The explanation must include the need for a maintenance schedule.

Assessment Guidelines

For this Outcome, it is suggested that part of the assessment could consist of a report which might be combined with that of Outcomes 2 and 4 and as part of a single closed-book end of Unit assessment for the whole Unit. Questions used to elicit candidate response could take the form of an appropriate balance of multiple choice and restricted response type.

Ideally, candidates should produce the maintenance schedule in the context of their workplace. However, if for practical reasons the candidate cannot access suitable materials, evidence could be provided by means of a desk top study and/or literature search and review of an appropriate development as long as the Evidence Requirements are met.

Higher National Unit specification: statement of standards (cont)

Unit title: Water Operations: Materials and Components

Outcome 4

Explain corrosion prevention methods for the water industry

Knowledge and/or Skills

- ◆ Types of corrosion
- ◆ Causes of corrosion
- ◆ Corrosion prevention measure

Evidence Requirements

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

- ◆ describe three types of corrosion and their causes This must include acidic, air and soil corrosion.
- ◆ explain the effect of corrosion on metal and concrete within the water industry. This must include pitting of iron pipes, exposure of reinforcements and the consequences of these.
- ◆ explain three corrosion prevention methods for a given installation in the water industry. The explanation must include the appropriateness of the methods chosen.

Assessment Guidelines

For this Outcome, it is suggested that the assessment could consist of a report, for the practical components, which might be combined with that of Outcomes 2 and 3, and as part of a closed-book end assessment. Questions used to elicit candidate response could take the form of an appropriate balance of multiple choice and restricted response type.

Higher National Unit specification: statement of standards (cont)

Unit title: Water Operations: Materials and Components

Outcome 5

Describe the materials and components for installation and rehabilitation of wastewater collection systems

Knowledge and/or Skills

- ◆ Collection systems
- ◆ Installation
- ◆ Rehabilitation techniques

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by submitting a report which should describe:

- ◆ at least three types of wastewater collection systems in common use in the water industry. The description must include the appropriateness of the system and the materials and components used in each system.
- ◆ the installation procedure of a wastewater collection system. The installation procedure must include materials, components, jointing and testing.
- ◆ three rehabilitation techniques applicable to wastewater collections systems.

Assessment Guidelines

For this Outcome, it is suggested that the assessment could consist of a closed-book end assessment. Questions used to elicit candidate response could take the form of an appropriate balance of multiple choice and restricted response type.

Administrative Information

Unit code: F53L 34

Unit title: Water Operations: Materials and Components

Superclass category: TL

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Version	Description of change	Date

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Higher National Unit specification: support notes

Unit title: Water Operations: Water Materials and Components

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 candidates an underpinning knowledge of water industry materials and components to enable them to function or develop as water operatives and technicians, or to enable them to progress to more advanced study. It is suitable for those who are currently employed in, or who are seeking employment in the water industry or related occupational areas.

This Unit may be undertaken on a stand alone basis but has been developed as a mandatory Unit within the HNC in Water Operations.

Noted below is an indication of the content and context of the Unit. Recommended time allocations to each Outcome are given as guidance towards the depth of treatment that might be applied to each topic.

Outcome 1 Describe the properties and uses of Water Industry engineering materials (10 hours)

The properties and uses of plastic and metal materials commonly used within the water industry should be covered. The advantages and disadvantages of a range of different materials could be covered. The historical development in the use of materials highlighting key issues, including potential health issues could be included. The use of concrete technology in terms of uses and appropriateness as well as testing methods must be included. The use of materials for trench support systems could include the use of proprietary brands of trench support systems.

Outcome 2 Describe the process of material selection for a given network installation system within the water industry (15 hours)

This Outcome looks at the materials requirements for a given water network installation system. The appropriateness of materials to network installations and different situations should be covered. An appreciation of how historical factors influence material selection could be included.

Outcome 3 Explain the function of components used within the water industry (15 hours)

This Outcome considers the various components, including valves, used in the water industry and understanding their function and the interrelationship between different components. Candidates could produce a managed maintenance programme for water industry components in line with industry standards to assist understanding of the maintenance requirements of components.

Outcome 4 Explain corrosion prevention methods for the water industry (10 hours)

The various types of corrosion which may affect water and sewerage pipes and the effect of different types of soils on pipes and fittings should be covered. Corrosion protection methods employed within the industry should be covered to enable candidates to explain methods for a given installation.

Higher National Unit specification: support notes (cont)

Unit title: Water Operations: Water Materials and Components

Outcome 5 Describe the materials and components for installation and rehabilitation of wastewater collection systems (**10 hours**)

Explain the different types of wastewater systems and the materials and components associated with them. Describe the materials and components for rehabilitation techniques applicable to sewers and drainage systems.

Guidance on the delivery and assessment of this Unit

This Unit forms part of the HNC Water Operations 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 understand the importance of correct material and components selection in the UK water industry.

It is recommended that evidence for Outcomes is achieved through well planned course work, reports and input from Industry specialists. Assessment may be formative and summative and both may feature as part of the process.

Outcome 1 and 5 is assessed as a closed-book assessment whilst Outcomes 2–4 could be assessed through the combination of a report into the use of materials and components in the Water Industry and a closed-book assessment. The closed-book assessment for the Unit could be a single end of Unit assessment event. Where a combination of closed-book and report is used centres should ensure that expectations and instructions to candidates are clear.

However, if for practical reasons the candidate cannot access suitable materials, evidence could be provided by means of a desk top study and/or literature search and review of an appropriate development as long as the Evidence Requirements are met

Opportunities for developing Core Skills

There are opportunities to develop the written component of the Core Skill of *Communication* and the Core Skill *Problem Solving* to SCQF level 6 and the Core Skill *Information and Communication Technology* to SCQF level 5, although there is no automatic certification of Core Skills or Core Skills components.

Candidates may have the opportunity to develop the written component of the Core Skill *Communication* at SCQF 6 through the assessment for Outcomes 2–4 where they may have to research, write and develop a report that meets the requirements of the three Units.

The report for Outcome 2-4 may provide the opportunity for candidates to develop the Core Skill of *Problem Solving* if the report requires candidates to investigate materials requirements, the components and the corrosion prevention methods for water systems. This will entail candidates using Critical Thinking skills, Planning and Organising skills and Evaluation skills in deciding what would be the most appropriate to the given water system.

Higher National Unit specification: support notes

Unit title: Water Operations: Water Materials and Components

Should candidates use Information technology to research different materials and components there may be the opportunity to develop the Core Skill of *Information and Communication Technology* at SCQF level 5.

Open learning

This Unit may be delivered in a flexible/distance/open learning format with a limited physical tutor support. In this case, a considerable amount of independent study will be required, and to relate the knowledge to real events, it is recommended that the candidate should liaise with their employer so that the report for Outcome 2, 3 and 4 can be appropriately structured.

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: Materials and Components

This Unit is designed to help you to develop the skills and knowledge associated with the principles of materials and components used within the water industry. Ideally, you should be employed in, or seeking employment within the water industry as a water operative or technician. Whilst the Unit may be taken as a stand alone it has been developed as a mandatory Unit in the HNC Water Operations framework.

In Outcome 1 you will look at the properties and uses of plastic and metal materials commonly used within the water industry. This could include the advantages and disadvantages of a range of different materials as well as the historical development of materials used in the industry. The use of concrete technology in terms of uses and appropriateness as well as testing methods is included as well as the use of materials for trench support systems.

The second Outcome looks at the materials requirements for a given water network installation system. The appropriateness of materials to network installations and different situations and an appreciation of how historical factors influence material selection may be covered.

Outcome three considers the various components, including valves, used in the water industry, their function and the interrelationship between different components. You may produce maintenance programme for water industry components in line with industry standards to assist you in your understanding of the maintenance requirements of components.

The various types of corrosion which may affect water and sewerage pipes and the effect of different types of soils on pipes and fittings are covered in Outcome 4. Corrosion protection methods employed within the industry are also included here.

In Outcome 5 you will be able to explain the different types of wastewater systems and the materials and components associated with them. This will include the materials and components for installation and rehabilitation techniques applicable to sewers and drainage systems.

Outcome 1 and Outcome 5 are assessed through closed-book assessment. Outcome 2–4 could be assessed by a combination of closed-book and a report. The closed-book assessment may take the form of a single closed-book end of Unit assessment. Your centre will advise you how the assessment process will work.

There are opportunities to develop the written component of the Core Skills of *Communication* and the Core Skill *Problem Solving* to SCQF level 6 and the Core Skill *Information and Communication Technology* to SCQF level 5, although there is no automatic certification of Core Skills or Core Skills components.