



Higher National Unit specification

General information for centres

Unit title: Process Operations: Utilities

Unit code: F815 34

Unit purpose: The purpose of this Unit is to give candidates the knowledge and understanding of the principles, application and operation of plant and equipment associated with the provision of utility services to an oil and gas production installation. As such, this Unit will contribute to candidate's development as process operations or measurement and control technicians within this key industry.

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

- 1 Explain the principles, applications and operations of utility systems for the provision of power.
- 2 Explain the principles, applications and operation of utility systems for the provision of Heating Ventilation and Air Conditioning (HVAC).
- 4 Explain the principles, applications and operations of utility systems for the provision of ancillary services.
- 5 Evaluate the specific safety and environmental implications for utility systems.

Credit points and level: 1HN credit at SCQF level 7: (8 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, candidates will find it beneficial to have some knowledge and understanding of the oil and gas process context in which this Unit appertains which may be evidenced by the possession of the following Unit:

F811 34: Petroleum Industry: Organisation, Products and Process

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

General information for centres (cont)

Context for delivery: This Unit was developed as an optional Unit within the context of the HNC/HND award in Petroleum Process Technology, Operations and Control. If this Unit is delivered as part of another 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: Assessment on Outcome 1, 2, 3 and 4 may be conducted individually or integrated into one or more combined assessments as appropriate. Assessment for all Outcomes should be composed of short answer, restricted response and/or structured essay type questions. Assessment must be carried out under controlled, closed-book, supervised conditions.

Candidates must achieve all of the minimum evidence specified for each outcome in order to pass the Unit.

Higher National Unit specification: statement of standards

Unit title: Process Operations: Utilities

Unit code: F815 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 principles, applications and operations of utility systems for the provision of power

Knowledge and/or Skills

- ◆ Prime movers
- ◆ Electrical power generation
- ◆ Operational requirements

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can explain the principles, applications and operations of utility systems for the provision of power.

Evidence for the Knowledge and/or Skills items in Outcome 1 will be assessed through sampling. Candidates will be assessed on two of the three items in the knowledge and skills list. Assessment must be carried out under supervised conditions.

Where sampling takes place, a candidate's response can be judged to be satisfactory where evidence is sufficient to meet the requirements for each item by showing that the candidate is able to:

- ◆ Explain the principles, applications, performance specifications and operational characteristics of diesel engines and gas turbine engines.
- ◆ Explain the principles, applications, performance specifications and operational characteristics of electrical power generators and the electrical power distribution.
- ◆ Explain the operational requirements associated with the provision of power for process operations to include power requirements, operating procedures, control and monitoring, maintenance routines and safe working practices associated with prime movers and generators.

Assessment Guidelines

Outcome 1 may be assessed separately with a planned duration of no more than one hour. Alternatively, Outcome 1 may be assessed together with Outcomes 2 and/or Outcome 3, and/or Outcome 4 with an aggregation of the planned time for the combined assessment being commensurate with the assessment guidelines for individual Outcomes.

Higher National Unit specification: statement of standards (cont)

Unit title: Process Operations: Utilities

Evidence of candidate knowledge and understanding may take the form of short answer, restricted response or structured essay type questions.

Evidence should be generated through assessment undertaken in controlled supervised conditions. Assessments should be conducted under closed-book conditions and as such candidates should not bring text books, course notes, programmable calculators or mobile communication devices to the assessment.

Outcome 2

Explain the principles, applications and operation of utility systems for the provision of Heating Ventilation and air Conditioning (HVAC)

Knowledge and/or Skills

- ◆ Operational requirements
- ◆ Heating
- ◆ Air conditioning
- ◆ Ventilation

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can explain the principles, applications and operation of utility systems for the provision of HVAC.

Evidence for the knowledge and/or skills items in Outcome 2 will be assessed through sampling. Candidates will be assessed on the first item and any two other items within the Knowledge and Skills list for this Outcome. Assessment must be carried out under supervised conditions.

Where sampling takes place, a candidate's response can be judged to be satisfactory where evidence is sufficient to meet the requirements for each item by showing that the candidate is able to:

- ◆ Explain the operational requirements associated with the provision of HVAC for process plant installations to include HVAC requirements, operating procedures, control and monitoring, maintenance routines and safe working practices associated with HVAC equipment.
- ◆ Explain the operating principles, applications, performance specifications and operational characteristics of space heating systems and hot water systems for process plant installations.
- ◆ Explain the operating principles, performance specifications and operational characteristics of air conditioning for process plant installations.
- ◆ Explain the operating principles, applications, performance specifications and operational characteristics ventilation for process plant installations.

Higher National Unit specification: statement of standards (cont)

Unit title: Process Operations: Utilities

Assessment Guidelines

Outcomes 2 may be assessed separately with a planned duration of no more than one hour. Alternatively, Outcome 1 may be assessed together with Outcomes 1 and/or Outcome 3, and/or Outcome 4 with an aggregation of the planned time for the combined assessment being commensurate with the assessment guidelines for individual Outcomes.

Evidence of candidate knowledge and understanding may take the form of short answer, restricted response or structured essay type questions.

Evidence should be generated through assessment undertaken in controlled supervised conditions. Assessments should be conducted under closed-book conditions and as such candidates should not bring text books, course notes, programmable calculators or mobile communication devices to the assessment.

Outcome 3

Explain the principles, applications and operations of utility systems for the provision of ancillary services.

Knowledge and/or Skills

- ◆ Compressed air
- ◆ Fuel
- ◆ Water
- ◆ Steam
- ◆ Chemicals

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can explain the principles, applications and operations of utility systems for the provision of ancillary services.

Evidence for the knowledge and/or skills items in Outcome 3 will be assessed through sampling. Candidates will be assessed on three of the five items in the knowledge and skills list. Assessment must be carried out under supervised conditions.

Higher National Unit specification: statement of standards (cont)

Unit title: Process Operations: Utilities

Where sampling takes place, a candidate's response can be judged to be satisfactory where evidence is sufficient to meet the requirements for each item by showing that the candidate is able to:

- ◆ Explain the operational requirements associated with the provision of compressed air for process plant installations to include their applications, system requirements, operating procedures, control and monitoring, maintenance routines, and safe working practices.
- ◆ Explain the operational requirements associated with the provision of fuel for process plant installations to include applications, system requirements, operating procedures, control and monitoring, maintenance routines, and safe working practices.
- ◆ Explain the operational requirements associated with the provision of water for process plant installations to include applications, system requirements, operating procedures, control and monitoring, maintenance routines, and safe working practices.
- ◆ Explain the operational requirements associated with the provision of steam for process plant installations to include applications, system requirements, operating procedures, control and monitoring, maintenance routines, and safe working practices.
- ◆ Explain the operational requirements associated with the provision of chemicals for process plant installations to include applications, system requirements, operating procedures, control and monitoring, maintenance routines, and safe working practices.

Assessment Guidelines

Outcome 3 may be assessed separately with a planned duration of no more than one hour. Alternatively, Outcome 1 may be assessed together with Outcomes 1 and/or Outcome 2, and/or Outcome 4 with an aggregation of the planned time for the combined assessment being commensurate with the assessment guidelines for individual Outcomes.

Evidence of candidate knowledge and understanding may take the form of short answer, restricted response or structured essay type questions.

Evidence should be generated through assessment undertaken in controlled supervised conditions. Assessments should be conducted under closed-book conditions and as such candidates should not bring text books, course notes, programmable calculators or mobile communication devices to the assessment.

Higher National Unit specification: statement of standards (cont)

Unit title: Process Operations: Utilities

Outcome 4

Evaluate the specific safety and environmental implications for utility systems

Knowledge and/or Skills

- ◆ Waste disposal
- ◆ Fire detection systems
- ◆ Gas detection systems

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can explain the specific safety and environmental implications for utility systems.

Evidence for the Knowledge and/or Skills items in Outcome 4 will be assessed through sampling. Candidates will be assessed on two of the three items in the knowledge and skills list. Assessment must be carried out under supervised conditions.

Where sampling takes place, a candidate's response can be judged to be satisfactory where evidence is sufficient to meet the requirements for each item by showing that the candidate is able to:

- ◆ Explain the operational requirements associated with the provision of waste disposal for process plant installations to include system requirements, operating procedures, control and monitoring, maintenance routines, and safe working practices.
- ◆ Explain the operational requirements associated with the provision of fire detection for process plant installations to include system requirements, operating procedures, control and monitoring, maintenance routines, and safe working practices.
- ◆ Explain the operational requirements associated with the provision of gas detection for process plant installations to include system requirements, operating procedures, control and monitoring, maintenance routines, and safe working practices

Assessment Guidelines

Outcome 4 may be assessed separately with a planned duration of no more than one hour. Alternatively, Outcome 4 may be assessed together with Outcomes 1 and/or Outcome 2, and/or Outcome 3 with an aggregation of the planned time for the combined assessment being commensurate with the assessment guidelines for individual Outcomes.

Evidence of candidate knowledge and understanding may take the form of short answer, restricted response and/or structured essay type questions.

Evidence should be generated through assessment undertaken in controlled, supervised conditions. Assessments should be conducted under closed-book conditions and as such candidates should not bring text books, course notes, programmable calculators or mobile communication devices to the assessment.

Administrative Information

Unit code: F815 34
Unit title: Process Operations: Utilities
Superclass category: VG
Original date of publication: August 2009
Version: 01

History of changes:

Version	Description of change	Date

Source: SQA

© Scottish Qualifications Authority 2009

This publication may be reproduced in whole or in part for educational purposes provided that no profit is derived from reproduction and that, if reproduced in part, the source is acknowledged.

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: Process Operations: Utilities

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 relates to the provision of utility services for both on-shore and off-shore production installations as well as refinery and petrochemical processing installations. It has been designed to contribute to the broad capacity building context of process operations within the petrochemical industries. It has specially been designed to provide knowledge, understanding and skills to support operations in the specialist discipline of the provision of utilities comprising power, HVAC, compressed air, and ancillary services such as the supply of water, chemical, waste disposal and emergency warning systems to detect fire and gas.

The Unit is at SCQF level 7 and has been developed as part of the HNC/HND awards in Petroleum Process Technology, Operations and Control. In this context, the Unit has been designed to link to appropriate National Occupational Standards that form part of the suite of Scottish/National Vocational Qualifications (S/NVQs) in Process Operation: Hydrocarbons and Process Engineering Maintenance at Technician level. However this does not preclude the use of this Unit in other awards where it is appropriate and contributes relevance and added value. The Unit may also be delivered as a stand-alone Unit.

Access to this Unit is fully inclusive and at the discretion of the SQA approved delivery centre. However, candidates may find it beneficial to have a prior knowledge of this area as provided by the SQA HN Unit *F811 34: Petroleum Industry: Organisation, Products and Processes*.

This Unit has been written in order to allow candidates to develop knowledge, understanding and skills to allow candidates to achieve the following Outcomes:

- 1 Explain the principles, applications and operations of utility systems for the provision of power.
- 2 Explain the principles, applications and operation of utility systems for the provision of HVAC.
- 3 Explain the principles, applications and operations of utility systems for the provision of ancillary services.
- 4 Evaluate the specific safety and environmental implications for utility systems.

A list of topics for each Outcome is given below:

Higher National Unit specification: support notes (cont)

Unit title: Process Operations: Utilities

Outcome 1

- ◆ Explain:
 - principles of operation, applications, performance specifications and operational characteristics of diesel engines
 - principles of operation, applications, performance specifications and operational characteristics gas turbine engines
 - the principles of operation, applications, performance specifications and operational characteristics of electrical power generators
 - electrical power distribution
 - the operational requirements of power plant and generators for process applications to include power requirements, operating procedures, control and monitoring and maintenance routines
 - safe working practices associated with prime movers and generators

Outcome 2

- ◆ Explain:
 - HVAC operational requirements, operating procedures, control and monitoring, maintenance routines and safe working practices associated with HVAC equipment
 - operating principles, applications, performance specifications and operational characteristics of space heating systems for process plant installations
 - operating principles, applications, performance specifications and operational characteristics of hot water systems for process plant installations
 - operating principles, performance specifications and operational characteristics of air conditioning for process plant installations
 - operating principles, applications, performance specifications and operational characteristics of ventilation for process plant installations

Outcome 3

- ◆ Explain:
 - operational requirements associated with the provision of compressed air for process plant installations to include their applications, system requirements, operating procedures, control and monitoring, maintenance routines and safe working practices
 - operational requirements associated with the provision of fuel for process plant installations to include applications, system requirements, operating procedures, control and monitoring, maintenance routines and safe working practices
 - operational requirements associated with the provision of water for process plant installations to include applications, system requirements, operating procedures, control and monitoring, maintenance routines and safe working practices

Higher National Unit specification: support notes (cont)

Unit title: Process Operations: Utilities

Outcome 4

- ◆ Explain:
 - operational requirements associated with the provision of waste disposal for process plant installations to include system requirements, operating procedures, control and monitoring, maintenance routines, and safe working practices
 - operational requirements associated with the provision of fire detection for process plant installations to include system requirements, operating procedures, control and monitoring, maintenance routines, and safe working practices
 - operational requirements associated with the provision of gas detection for process plant installations to include system requirements, operating procedures, control and monitoring, maintenance routines, and safe working practices

Guidance on the delivery and assessment of this Unit

This Unit was developed as an optional Unit within the context of the HNC/HND award in Petroleum Process Technology, Operations and Control. It may be delivered as a stand-alone Unit or as part of another group award.

The content of the Outcomes of this Unit follows a logical delivery sequence.

This Unit may be delivered on a full-time, block release, open or blending learning, part-time day or part-time evening basis at the discretion of the SQA approved delivery centre. Learning and teaching methods may include a combination of lectures, tutorials, group work, practical assignments, computer-based simulations, case studies and industrial visits. Candidates should have access to examples of specification and performance information, diagrams, schematic layouts, and static displays typical of process industry utility plant and equipment to support the explanation of the operations, functions of main plant and equipment, and their construction features. Access to suitable practical or simulation facilities for demonstration purposes would be beneficial.

The use of flexible learning through on-line materials and methodologies is encouraged wherever possible to supplement and support the learning that takes place in the delivery centre. It is also recommended that candidates are directed to undertake internet research where a rich amount of material can be found that is relevant to the content of this Unit to support their learning. Wherever appropriate, it is recommended that relevant practical learning activities are used to support the development of the knowledge and understanding requirements of this Unit. At every appropriate opportunity, it is recommended that the delivery of this Unit reflects on the health, safety and environment implications relevant to the content and context of this Unit.

Opportunities are available within this Unit to develop the transferable Core Skills of *Communication* and *Problem Solving*, although these are not separately certificated.

Formal assessment of this Unit may take a number of different forms such as written tests, practical investigations, simulation exercises, and case studies. Assessments should require candidates to support their responses to question with suitable labelled process layout schematics and diagrams showing the construction features of plant and equipment. Laboratory work, simulation exercises and case studies could be used as formative assessments to enhance the learning experience of candidates.

Higher National Unit specification: support notes (cont)

Unit title: Process Operations: Utilities

Each Outcome may be assessed separately by assessment exercises of no more than one hour duration. Alternatively, assessments for individual Outcomes may be integrated into one or more combined assessments with a total assessment time of no more than four hours. Where sampling of knowledge and skills items is used for assessment, the sampling should be selected to meet the specific needs of the candidate cohort within the context of their current employment or progression goals.

Any assessment should be conducted under controlled, supervised conditions.

The single assessment should be carried out at the end of the delivery of the Unit; individual assessments should be carried out at the end of the delivery of each Outcome.

It should be noted that the candidates must achieve all the minimum evidence specified for each Outcome in order to pass the Unit.

Details on approaches to assessment are given under Evidence Requirements and Assessment guidelines under each Outcome in the Higher National Unit specification: Statement of Standards section. It is recommended that these sections be read carefully before proceeding with assessment of candidates.

Opportunities for developing Core Skills

There may be opportunities to gather evidence toward the following Core Skills within this Unit, although there is no automatic certification of Core Skills or Core Skills components in this Unit:

<i>Communication</i>	SCQF level 6
<i>Problem Solving</i>	SCQF level 6

Open learning

This Unit could be delivered by distance learning, which may incorporate some degree of on-line support. With regard to assessment, planning would be required of 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. Agreement would have to be made to ensure that a single assessment for the end test is delivered in a supervised environment under controlled conditions.

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

General information for candidates

Unit title: Process Operations: Utilities

This Unit has been designed to allow you to develop the knowledge, understanding and skills involved in the principles and operations of plant and equipment required for the provision of utility services within the petrochemical industries. As such, this Unit will contribute to your development as a process operations technician or a measurement and control technician within this key industry. The vocational focus of this Unit combines the necessary blend of key petrochemical utilities provision related technological principles with knowledge of their industrial process applications and operations in a safety and environmentally critical context.

The Unit comprises the following broad outcomes:

- 1 Explain the principles, applications and operations of utility systems for the provision of power.
- 2 Explain the principles, applications and operation of utility systems for the provision of HVAC.
- 3 Explain the principles, applications and operations of utility systems for the provision of ancillary services.
- 4 Evaluate the specific safety and environmental implications for utility systems.

These outcomes are linked to National Occupational Standard that form part of the suite of Scottish/National Vocational Qualifications (S/NVQs) in Process Operation: Hydrocarbons and Process Engineering Maintenance at Technician level.

Within this Unit, you will also have opportunities to develop the transferable Core Skills of Communication and Problem Solving, although these are not separately certificated.

Access to this Unit is fully inclusive and at the discretion of your SQA approved delivery centre. However, you may find it beneficial to have a prior knowledge of this area as provided by the SQA HN Unit *F811 34: Petroleum Industry: Organisation, Products and Processes*.

This Unit can be delivered on a full-time, block release, open or blending learning, part-time day or part-time evening basis at the discretion of your SQA approved delivery centre. Learning and teaching methods may include lectures, tutorials, practical assignments, computer-based simulations and case studies. The use of flexible learning through on-line materials and methodologies may be used to supplement and support the learning that takes place in the delivery centre.

Formal assessment of this Unit may take a number of different forms such as written tests, practical assignments, simulation exercises, and case studies. Assessments will normally be conducted at the end of the delivery of each Outcome. Where assessments are combined, these may be conducted toward the end of the Unit.