

## Higher National Unit Specification

### General information for centres

**Unit title:** Measurement of Quality

**Unit code:** DW6H 34

**Unit purpose:** This Unit is designed to enable the candidate to develop an understanding of techniques used to measure, control and improve the quality of processes and their outputs. It is also designed to enable candidates to select and use these techniques. It is intended for candidates who are in employment and who are undertaking a course of study relevant to their occupational role or who may wish to develop their career prospects.

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

- 1 Explain the importance of identifying customer requirements, process parameters for achieving Quality and analysing variation within processes.
- 2 Control and improve processes through the use of process capability indices and process control charts.
- 3 Select and use a published sampling plan.

**Credit points and level:** 1 HN 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 although candidates should possess good numeracy skills. Numeracy to a level of Intermediate 2 or above would be beneficial.

**Core Skills:** There are opportunities to develop the Core Skills of Communication at SCQF level 6, Numeracy at SCQF level 5 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.

**Assessment:** Assessments should take the form of open-book assessments conducted under controlled conditions.

## **General information for centres (cont)**

Evidence for this Unit could be generated through three separate assessments. Outcomes 1 and 2 could each be assessed by a case study and restricted response questions. Outcome 3 could be assessed as a single assignment using data generated by the centre. Evidence could also be generated through a single case study for all Outcomes.

## Higher National Unit specification: statement of standards

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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

Explain the importance of identifying customer requirements, process parameters for achieving Quality and analysing variation within processes

#### Knowledge and/or skills

- ◆ Customer requirements
- ◆ The basis for identifying process parameters for achieving Quality
- ◆ Sources, types and causes of variation within processes
- ◆ Simple probability calculation
- ◆ Properties of the Normal distribution

#### Evidence Requirements

Candidates will need to provide evidence to demonstrate the knowledge and/or skills items by showing that they can:

- ◆ explain the importance of identifying customer requirements for a given product or service
- ◆ explain the origin of process parameters for achieving quality
- ◆ identify the sources of variation within a given process, classify these sources by type and suggest possible causes of the variation
- ◆ calculate the probability of both joint and mutually exclusive events for a given product or service
- ◆ calculate any area under a Normal distribution curve

#### Assessment guidelines

Centres could prepare a case study with structured questions linked to it which allow the candidate to demonstrate the knowledge/skills requirements.

Because not all candidates will be familiar with the process covered by the case study, it should be given to the candidate prior to the assessment taking place. However, numerical data must not be given prior to the assessment.

The assessment should be an open book assessment conducted under controlled conditions. Candidates may be allowed access to notes, books and statistical tables. The suggested time allowed for the assessment is one hour.

## Higher National Unit specification: statement of standards (cont)

**Unit title:** Measurement of Quality

### Outcome 2

Control and improve processes through the use of process capability indices and process control charts

#### Knowledge and/or skills

- ◆ Calculation and use of process capability indices — Cp, Cpk
- ◆ Construction and use of a process control chart
- ◆ Interpretation of a process control chart

#### Evidence Requirements

Candidates will need to provide evidence to demonstrate the knowledge and/or skills items by showing that they can:

- ◆ calculate Cp and Cpk indices for a given process and explain whether or not the process is capable
- ◆ construct a process control chart including calculation of control limits and data plotting for a given process
- ◆ interpret a control chart including action to be taken when control limits are breached

Candidates will construct and interpret a process control chart for either variable or attribute data.

The assessment is an open book assessment to be conducted under controlled conditions.

#### Assessment guidelines

Centres could prepare a case study with structured questions linked to it which allow the candidate to demonstrate the knowledge/skills requirements.

Because not all candidates will be familiar with the process covered by the case study, it could be given to the candidate prior to the assessment taking place. However, numerical data should not be given prior to the assessment.

### Outcome 3

Select and use a published sampling plan

#### Knowledge and/or skills

- ◆ Producer risk, consumer risk, limiting quality level, acceptable quality level
- ◆ Operating characteristic curve
- ◆ Average outgoing quality level
- ◆ Published Sampling Plans

## **Higher National Unit specification: statement of standards (cont)**

**Unit title:** Measurement of Quality

### **Evidence Requirements**

Candidates will need to provide evidence to demonstrate the knowledge and/or skills items by showing that they can:

- ◆ select an appropriate published sampling plan for a given situation
- ◆ explain the operation of single and double sampling plans
- ◆ construct an Operating Characteristic curve for a single sampling plan
- ◆ construct an Average Outgoing Quality Level curve for a single sampling plan
- ◆ explain the producer risk, consumer risk, limiting quality level and acceptable quality level for a single sampling plan

Candidates will select a sampling plan for either variable or attribute data.

The assessment will be an open book assessment conducted under controlled conditions.

### **Assessment guidelines**

Candidates may be allowed access to notes, books, statistical tables and relevant published sampling plans. The suggested time allowed for the assessment is two hours.

## **Administrative Information**

<b>Unit code:</b>	DW6H 34
<b>Unit title:</b>	Measurement of Quality
<b>Superclass category:</b>	VD
<b>Date of publication:</b>	August 2006
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## **Higher National Unit specification: support notes**

### **Unit title: Measurement of Quality**

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 is likely to form part of a Group Award designed to provide candidates with knowledge in the field of Quality. The Unit is designed to provide candidates with relevant underpinning knowledge in relation to the behaviour of processes and current measures used by industries to control and improve the quality of the output from processes.

The word 'process' should be interpreted broadly in terms of products, services and information. This is a generic Unit that is relevant to all industry sectors. Centres can contextualise the Unit by selection of appropriate processes and measurement criteria.

Outcome 1 examines the setting of process parameters that are in accordance with customer requirements and analysing the behaviour of processes. This analysis comprises the calculation of the probability of both joint and mutually exclusive events and, using statistical tables, the calculation of areas under the Normal distribution curve. These calculations provide the underpinning knowledge for outcomes 2 and 3 and contribute towards the Core Skill of Numeracy.

Outcome 2 demonstrates how to prevent defective products and services through the determination and improvement of process capability and the construction and interpretation of process control charts for both variable and attribute data.

Outcome 3 demonstrates how to control the quality of products and services using published sampling schemes. Outcomes 2 and 3 contribute towards numeracy and using graphical information core skills.

### **Guidance on the delivery and assessment of this Unit**

Candidates should have access to relevant, current standards and specifications, appropriate statistical tables, eg Murdoch and Barnes Statistical Tables, and also to an electronic calculator.

Teaching should be supported with relevant textbooks, case studies and worked examples. Centres will need to devise several data sets for both variable and attribute data. It is anticipated that this Unit may be delivered to candidates with a variety of industrial backgrounds and, wherever possible, teaching should be slanted towards their individual needs. Candidates should be encouraged to use their initiative to identify opportunities where the measurement techniques could be used in their own workplaces.

## Higher National Unit specification: support notes (cont)

**Unit title:** Measurement of Quality

### *Opportunities for developing Core Skills*

The delivery and assessment of this Unit may contribute towards the 'Reading' and 'Writing' components of the Core Skill of Communication at SCQF level 6 because of the requirement to read textbooks, Statistical tables and Standards and to provide written answers to formative and summative assessments.

The delivery and assessment of this Unit may also contribute to all components of the Core Skill of Numeracy at SCQF level 5 because of the requirement to calculate probabilities, areas under the Normal frequency distribution curve and capability indices in Outcomes 1 and 2. Outcomes 2 and 3 require the candidate to construct and interpret graphs of process control charts and sampling plans which contributes towards the 'Using Graphical Information' component.

The delivery and assessment of this Unit may also contribute towards the 'Critical Thinking' component of the Core Skill of Problem Solving at SCQF level 6 because Outcome 1 requires candidates to critically analyse processes.

### **Open learning**

This unit could be delivered by open or distance learning methods. Centre devised supervision agreements should detail controlled conditions to ensure authenticity of evidence. For further information and advice please refer to the SQA guide: *Assessment and Quality Assurance for Open and Distance Learning* (A1030, February 2001)

### **Candidates with additional support needs**

This Unit specification is intended to ensure that there are no artificial barriers to learning or assessment. 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. For information on these, please refer to the SQA document *Guidance on Alternative Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs*, which is available on the SQA website [www.sqa.org.uk](http://www.sqa.org.uk).

## General information for candidates

### Unit title: Measurement of Quality

This Unit is a one credit Unit at SCQF level 7. It is recommended that prior to undertaking this unit you possess good numeracy skills. Numeracy to a level of Intermediate 2 or above would be beneficial. The unit itself will contribute to the development of your numeracy skills. You will need an electronic calculator.

The Unit is designed to introduce you to two methods for measuring quality, statistical process control charts and published sampling plans. Upon successful completion of the Unit you will be able to use these two methods and understand how they improve processes, products and services by preventing defective products and services from being produced.

In **Outcome 1** you will learn that process parameters for quality are determined by the customers' requirements. You will also learn how processes behave in terms of variation within a process. You will learn to calculate simple probabilities and will understand the properties of the Normal distribution. This knowledge underpins the techniques taught in outcomes 2 and 3.

In **Outcome 2** you will learn how to prevent the production of defective products and services by calculating process capability indices, and constructing, using and interpreting two types of process control chart. You will also learn how these techniques contribute to the improvement of processes, products and services.

In **Outcome 3** you will learn how to select and use appropriate published sampling plans to control the quality of products and services.

The content of the Unit will be made relevant through the use of appropriate examples and case studies.

Each outcome is assessed separately and may be conducted under direct supervision of the Centre or its nominee. You will be allowed access to notes, textbooks, statistical tables, relevant standards and an electronic calculator.

For successful completion of this Unit you will be required to achieve a satisfactory performance in all of the outcome assessments.