

## Higher National Unit Specification

### General information for centres

**Unit title:** Facilities Layout and Analysis

**Unit code:** DT5N 35

**Unit purpose:** This Unit has been designed to allow candidates to develop their knowledge and understanding of facilities layouts within a manufacturing context and after analysis to advise on improvements.

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

- 1 Describe the selection factors used for materials handling equipment.
- 2 Evaluate a facilities layout with respect to productivity and costs.
- 3 Critically analyse and advise improvement for a given facilities layout and material handling system.

**Credit points and level:** 1 HN Credit at SCQF level 8: (8 SCQF credit points at SCQF level 8\*)

*\*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:** Candidates should have a knowledge and understanding of planning and control systems found within most manufacturing environments. This may be evidenced by possession of the HN Units: Production Planning and Control and Economics of Manufacture.

Knowledge and understanding of planning and control systems acquired as a result of employment experience may be sufficient to allow direct access to this Unit.

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

Written Communication	Higher
Using Information Technology	Higher
Critical Evaluation	Higher
Working with Others	Intermediate 2

**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

**Assessment:** Outcome 1 will be assessed by means of a written assessment paper taken at a single assessment event lasting no more than one hour which should be conducted under controlled, supervised conditions.

Assessment of Outcomes 2 and 3 should be combined together to form one assessment consisting of a written report and oral questioning by the lecturer. Both these outcomes should be assessed under open book conditions. In Outcome 2 candidates should benchmark an existing manufacturing layout and in Outcome 3 the model should be analysed with a view to making recommendations for improvements to the layout.

## Higher National Unit specification: statement of standards

**Unit title:** Facilities Layout and Analysis

**Unit code:** DT5N 35

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 selection factors used for materials handling equipment

#### Knowledge and/or skills

- ◆ Equipment appraisal
- ◆ Unitisation
- ◆ Equipment selection
- ◆ Material properties
- ◆ Economics of Manufacture

#### Evidence Requirements

Evidence for the knowledge and/or skills in this Outcome will be provided on a sample basis. The evidence may be presented in response to specific questions. Each candidate will need to demonstrate that they can answer questions based on a sample of the items shown above. In any assessment of this Outcome **four out of five** knowledge and/or skills items should be sampled.

In order to ensure that candidates will not be able to foresee what items they will be questioned on, a different sample of four out of five knowledge and/or skills items is required each time the outcome is assessed.

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

- ◆ equipment appraisal considerations
- ◆ examples of unitisation detailing pros and cons
- ◆ manufacturing specifications and appropriate equipment selection
- ◆ relevant material properties to an application
- ◆ impact of handling systems on overhead costs

This Outcome should be assessed by means of one single assessment paper taken at a single assessment event that should last no more than one hour. Evidence should be generated through assessment undertaken in controlled, supervised conditions. Assessment should be conducted under closed-book conditions and as such candidates must not be allowed to bring any textbooks, handouts or notes to the assessment.

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

**Unit title:** Facilities Layout and Analysis

### **Assessment guidelines**

The assessment paper could comprise short answer and restricted response questions.

### **Outcome 2**

Evaluate a facilities layout with respect to productivity and costs

#### **Knowledge and/or skills**

- ◆ Productivity
- ◆ Process and flow diagrams
- ◆ Cost implications

### **Outcome 3**

Critically analyse and advise improvement for a given facilities layout and material handling system

#### **Knowledge and/or skills**

- ◆ Simulation software/computer assistance tools
- ◆ System Modelling
- ◆ Model Development

#### **Evidence Requirements**

All knowledge and/or skills items in Outcomes 2 and 3 should be assessed. Candidate evidence for both Outcomes should be presented in the following two parts: a written report plus oral questioning by the lecturer.

With regard to Outcome 2, candidates will need evidence to demonstrate their knowledge, understanding and skills by showing that they can:

- ◆ demonstrate a knowledge of productivity
- ◆ identify outputs/inputs relevant to system
- ◆ produce process and flow diagrams to agreed specification
- ◆ state costs implications for the facilities layout

With reference to Outcome 3, candidates will need evidence to demonstrate their knowledge, understanding and skills by showing that they can:

- ◆ demonstrate competence in the use of software tools
- ◆ develop a model against clear manufacturing criteria
- ◆ provide correct proposals for change after model analysis

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

### **Unit title:** Facilities Layout and Analysis

Candidates should be provided with details of the required report format and should include, as a minimum, the items listed under the bullet points in the Evidence requirements. While candidates are not required to prepare their report under controlled, supervised conditions, centres should make every reasonable effort to ensure that reports are candidates' own work.

The purpose of the oral questioning is to confirm that the candidate has a clear knowledge and understanding of benchmarking an existing manufacturing layout and is able to model and recommend improvements to the layout.

### **Assessment guidelines**

The report, which should include appropriate diagrams and other relevant materials, could be between 750 and 1,000 words in length. It is anticipated that oral questioning of the candidate will normally take 20 to 30 minutes.

It is strongly recommended that centres develop a checklist(s) to assess the candidate's performance in the written report and oral questioning.

The oral questioning by the lecturer should help to confirm if the report is the candidate's own work.

## **Administrative Information**

<b>Unit code:</b>	DT5N 35
<b>Unit title:</b>	Facilities Layout and Analysis
<b>Superclass category:</b>	XH
<b>Date of publication:</b>	August 2005
<b>Version:</b>	01
<b>Source:</b>	SQA

© Scottish Qualifications Authority 2006

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: Facilities Layout and Analysis**

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 designed to provide candidates with a solid basis to acquire knowledge, understanding and skills in the benchmarking, software model creation and analysis of facilities layouts for typical manufacturing systems. Unit content and context should be related directly to layouts that both candidates and lecturing staff are familiar with.

In Outcome 1 candidates should be encouraged to explore the relationship between the layout of manufacturing plant/equipment and material handling/storage approaches. Factors should be identified that affect the choice of materials handling equipment detailing operational characteristics and application limitations, i.e. weight, throughput, noise, product envelope. The need for energy conservation should be discussed together with current environmental legislative requirements pertinent to the selection process. The storage methods adopted for the selected materials handling system should highlight the relationship between the two entities, i.e. unitisation pros and cons, bulk/rack/palletisation storage methods.

Outcomes 2 and 3 should be combined to form one assessment exercise in order to meet all requirements within both knowledge and skills statements. It is anticipated that candidates will use a commercially available simulation software package in order to fulfil Unit requirements, e.g. Simul8, Microsoft Excel and Witness. A wide variety of free sample software is available on the World Wide Web. The complexity of the facilities layout problem is at the discretion of the centre. However, centres should ensure that all knowledge and skills requirements are covered in the final report submitted by each candidate. Centres should encourage group working, especially for those candidates from similar industrial backgrounds.

Centres could develop a system requirements template for varying manufacturing situations. The template should specify all available resources and their respective properties, e.g. inputs, outputs, downtime, manpower, product range, costs, quality levels. Candidates should be set simple tutorial tasks in order to build both competence and confidence before attempting the main core assessment task for both outcomes. Tutorial exercises could involve the building of a paper model covering such aspects as Space Affinity diagrams, from-to (P-Q) charts, detailing distance/quantity relationships, affinity relationships for non-flow items.

Part of these tutorial exercises should have some degree of analysis using 'what if' scenarios in order to assist candidates to fully understand the benefits of simulated models. It is recommended that candidates are exposed to identifying constraint issues addressing flow of materials, people, environment, shape, and utilities. Typical 'what if' scenarios could include moving to larger premises, down sizing, new equipment introduction, increased product mix, cellular working methods.

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

### Unit title: Facilities Layout and Analysis

The Unit is designed to enable candidates to gain knowledge and skills in simulating and analysing a manufacturing system. These skills are by their nature generic to all modelling professionals. Once these skills are gained, it is anticipated that candidates could apply them to most real world situations outwith the field of manufacturing.

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

It is recommended that the delivery and assessment time for Outcome 1 should be no more than 10 hours with the remainder of the notional unit delivery time being dedicated to Outcomes 2 and 3.

In Outcome 1 candidates should be directed towards various methods of transporting materials within manufacturing environments. Wide use should be made of suppliers' web sites and specification requirements. Material properties relevant to equipment selection should be emphasised. This could be covered by generating tables of properties relevant to handling items.

In Outcomes 2 and 3 delivery and assessment could take the form of the following:

Candidates could be given CAD drawings showing the layout of an existing manufacturing facility and a manufactured part from this facility. Together with these drawings candidates could be given raw data regarding the number of trip distances between each manufacturing area. Travel distances could be lifted directly from the drawing. From this data and drawing information candidates could be asked to generate a spreadsheet detailing an efficiency index for the existing layout. From further analysis of all information and the existing spreadsheet, candidates could be asked to advise on an improved layout. The new layout should be drawn using appropriate CAD tools and verified using the previously generated spreadsheet.

#### *Opportunities for developing Core Skills*

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

Written Communication	Higher
Using Information Technology	Higher
Critical Evaluation	Higher
Working with Others	Intermediate 2

### Open learning

If the Unit is delivered by Open Learning then candidates should attend a centre for a minimum of 4 hours. The closed book, written paper for Outcome 1 should be attempted under controlled, supervised conditions. For Outcomes 2 and 3 the candidate will need to provide a 'witness statement' from a responsible and competent person who can confirm that the evidence presented in the form of a report and software model, is the candidate's own work. Periodic reviews with the candidate should be carried out in order to complement the witness statement.



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

**Unit title:** Facilities Layout and Analysis

### **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 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: Facilities Layout and Analysis**

This Unit has been designed to provide you with the knowledge, understanding and skills that will enable you to properly evaluate the layout of an existing or proposed manufacturing workplace and then improve it. You should be introduced to the latest software and analysis tools that are required in order to record and improve a facilities layout.

Before starting this Unit you should have a basic knowledge and understanding of production planning and control methods used in industry. All manufacturing environments work to a schedule, a well designed facilities layout is key to maintaining that schedule whilst minimising overhead and other indirect costs.

In Outcome 1 you will be introduced to material handling systems in their various forms. You will be expected to complement your learning in class by referring to various other information sources available via supplier journals/magazines, videos and supplier sites on the World Wide Web. The assessment for Outcome 1 will consist of a short answer paper. This assessment paper will be conducted under supervised, closed-book conditions in which you will not be allowed to take notes, textbooks etc into the assessment. Normally you will be expected to have completed this assessment within one hour.

The assessments for Outcomes 2 and 3 will be integrated together in the form of a practical build exercise and a formal report. This assessment exercise is open book where you have unlimited access to notes and any further sources of information required to complete the assessment. All submitted work must be your own with all sources of information properly acknowledged. You should attempt various exercises based on the assessment criteria before attempting the main assessment task. Your centre should encourage you to build on the experience you may have from a manufacturing environment or to actually visit a manufacturing site in your area.

By the end of the Unit you should have developed knowledge and skills in facilities layout and analysis in that you will be competent in benchmarking most manufacturing layouts. You should also be able to advise on improvements based on efficient and effective use of available analysis tools and methods.