

SQA Advanced Unit Specification

General information for centres

Unit title: Poultry Buildings and Mechanisation

Unit code: HW9K 47

Unit purpose: This unit will allow candidates to develop the knowledge and skills to enable effective management of buildings and equipment for commercial poultry production. The unit considers all aspects from the procedures involved in the creation of a new building, through to how to manage the building to achieve the requirements of poultry production. Hence the unit considers the equipment requirements for environmental modification and their control, the equipment for feeding and watering the stock, and finally considers the effective management of building and machine maintenance and equipment back-up needs. As the energy costs of poultry buildings can be very high, appropriate energy management techniques are introduced.

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

- 1 describe the considerations in the development of poultry buildings
- 2 explain the environmental control of poultry buildings
- 3 explain the mechanisation associated with poultry buildings
- 4 explain the maintenance of buildings and equipment

Credit points and level: 1 SQA 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 National 1 to Doctorates.*

Recommended prior knowledge and skills: It is recommended that candidates have an awareness of poultry egg and meat production systems. This might be evidenced by possession of the following SQA Advanced Units: HW9P 47 *Poultry Meat Production Systems* and HW9N 47 *Poultry Egg Production Systems*. In addition, sufficient mathematical skills to manipulate simple equations and perform arithmetic functions equivalent to SCQF level 5 will be required.

Core skills: There are opportunities to develop the core skill of *Numeracy* at SCQF level 6 in this unit, although there is no automatic certification of core skills or core skills components.

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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: This unit is likely to be assessed using two instruments of assessment: Outcomes 1, 2 and 3 are assessed by an assignment and restricted response questions, and Outcome 4 by means of an open-book assignment.

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SQA Advanced 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

Describe the considerations in the development of poultry buildings

Knowledge and/or skills

- ◆ Site selection
- ◆ Regulatory controls
- ◆ Building design principles
- ◆ Building services

Evidence requirements

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

- ◆ describe a site selection procedure appropriate to the development of a specified poultry building
- ◆ describe the purpose of planning control and building control and their applicability to development of a specified poultry building
- ◆ explain the relationship between the specified poultry building and the specification of four design elements. The four design elements covered must include at least one structural, and one fabric element.
- ◆ describe the building services required for the specified poultry building. Descriptions must cover utilities and mechanical services.

Assessment guidelines

This outcome may be assessed by an assignment using restricted response questions. It may be combined with the assessment for Outcomes 2 and 3, with the same development used throughout. Please see further information under Assessment Guidelines for Outcome 3.

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Outcome 2

Explain the environmental control of poultry buildings

Knowledge and/or skills

- ◆ Air qualities
- ◆ Heat and moisture balances
- ◆ Artificial lighting
- ◆ Behaviour-environment interactions
- ◆ Environmental controllers

Evidence requirements

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

- ◆ evaluate the impact on air quality of changes in two environmental parameters through the use a psychrometric data
- ◆ evaluate the ventilation requirements of a poultry building by means of a simple heat or moisture balance in either summer or winter conditions
- ◆ explain the relative merits of alternative technologies for artificial lighting of a broiler or layer house in terms of bird welfare and management
- ◆ explain the action that a building manager can take to correct an environmental deficiency in a poultry house as indicated by bird behaviour
- ◆ explain the mode of operation of two contrasting environmental controller types

This is an open-book assessment.

Assessment guidelines

This outcome may be assessed by an assignment using restricted response questions. It may be combined with the assessment for Outcomes 1 and 3 with the same development used throughout. Please see further information under Assessment Guidelines for Outcome 3.

Outcome 3

Explain the mechanisation associated with poultry buildings

Knowledge and/or skills

- ◆ Poultry brooder and heating systems
- ◆ Pump and fan specification
- ◆ Mechanisation for feed production
- ◆ Feed and water distribution

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Evidence requirements

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

- ◆ explain the construction and management of either a brooder system, or whole house poultry heating system
- ◆ select either a fan or a pump for a given situation, with two valid supporting reasons using manufacturers' performance data and specifications
- ◆ explain the mechanised feed production equipment requirements suitable to produce pelleted feed from grain, meal and powder ingredients for a poultry feed operation
- ◆ specify an appropriate layout of equipment for distributing feed and water to a specified broiler or layer house in accordance with good practice in terms of space and positional requirements. The layout of equipment must cover the areas of storage, transport and feeder/drinker

Assessment guidelines

This outcome may be assessed by an assignment using restricted response questions. It may be combined with the assessment for Outcomes 1 and 2.

The assessment may take the form of an assignment of about 2,000 to 2,500 words or equivalent plus supporting calculations, diagrams and sketches. Candidates could satisfy each of the evidence requirements in the context of a single poultry production operation of their choice, or they may consider a given case study scenario. A suggestion would be a site, buildings and equipment requirements to produce 60,000 birds annually. Candidates could use additional published data (eg pelleting machine manufacturers' leaflets) to aid explanations and selection. If candidates use a site of their choice, they should check with the tutor that all evidence can be obtained from the site.

Outcome 4

Explain the maintenance of buildings and equipment

Knowledge and/or skills

- ◆ Failsafe arrangements
- ◆ Building maintenance
- ◆ Equipment maintenance
- ◆ Maintenance management

Evidence requirements

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

- ◆ explain two failsafe provisions appropriate to poultry buildings
- ◆ describe a planned maintenance programme for a poultry building and one named piece of equipment
- ◆ describe the planning and monitoring responsibilities of a poultry farm maintenance manager to limit the adverse effects of breakdowns

Assessment guidelines

This outcome may be assessed by means of a closed-book assessment with a short selection of restricted and extended response questions.

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Administrative information

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Unit title:	Poultry Buildings and Mechanisation
Superclass category:	SK
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History of changes:

Version	Description of change	Date

Source: SQA

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Further information

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SQA Advanced Unit Specification: support notes

Unit title: Poultry Buildings and Mechanisation

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

The context of this unit is quite specifically the UK poultry sector. However, within this there is the opportunity to apply the unit to the meat or the egg-producing sector, and many of the aspects are sufficiently generic to be applicable worldwide. Hence the candidate may study this unit from many different angles including a turkey farmer wishing to optimise the housing environment or an egg producer wishing to produce his own feed. In all cases the unit considers in detail intensively housed stock, although, where relevant, comparison with more extensively housed stock could be made.

Outcome 1 is principally concerned with the creation of new existing poultry buildings. The principal areas for study are therefore the design specification and the planning, building control and other regulatory processes that flow from this. However, it is quite possible to study the unit in the context of the redevelopment of existing buildings, particularly where an expansion of existing facilities is envisaged. Care must be exercised to ensure the key features of the building and services that are required are clearly linked to the type of building that is being considered — a feed preparation building will have a quite different specification to a layer house.

Outcome 2 develops Outcome 1 and considers in detail the creation of the appropriate environment within the building to suit its purpose. Hence much of the work leading up to the assessment of this Outcome can be based on a study of heat and moisture balances. Developing a clear understanding of the temperature moisture relationships of air will be important as will a clear understanding of the difference between the environmental parameters to be controlled such as relative humidity/vapour pressure, gas levels especially carbon oxides and ammonia, and dust levels, and the methods of control such as ventilation, humidifiers and heating systems. Control methods will predominantly be based on heating and ventilation, and in turn these will be dependant on the thermal properties of the building which must be clearly understood. The consideration of incandescent, fluorescent, discharge and LED lighting and gas and electrical heating systems should include the environmental consequences to assist candidates properly compare different systems. Candidates should compare the operation and performance of simple on/off controls in open and closed-loop systems, proportional and proportional integral differential (PID) controllers.

Outcome 3 considers some of the more common equipment associated with poultry buildings. This Outcome is clearly linked with Outcome 2 as several pieces of equipment such as brooders/heaters and fans are used to control the environment. Candidate consideration of heater should look at the behavioural response of birds to too much and too little heat at the various growth stages. Other examples of environment behaviour interaction that could be studied include response to humidity, ammonia and excess airspeed.

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Pump and fan selection criteria: fans and pumps are pieces of equipment with applications in many spheres, however in this context it is suggested that the focus is on ventilation fans and pumps for drinking water supply systems. In both cases candidates could explore, in a practical setting if at all possible, the relationship between flow and dynamic head as the principal selection criteria. However the main focus of this outcome should be on feed and water preparation and distribution. Candidates should consider raw ingredient storage, milling proportioning, mixing, pelleting cooling and product storage, internal transport mechanisms, and various feeder types in common use including trough, conveyor and pan systems. The suitability for different feed types should be considered as well as layout constraints, such as the number of birds per feeder or length of track, so that commercially acceptable proposals for the layout of feeding systems can be made. Similarly for water distribution; filtration, sanitisation and nozzle arrangements need to be closely considered as should the means for minimising the environmental impact.

Finally, Outcome 4 briefly considers building and equipment maintenance. Since much maintenance in buildings revolves around failsafe apparatus, the outcome includes a short section on failsafe elements. For both buildings and equipment the desirability and the features of a planned maintenance system should be explored in detail. This may consider the obligations on buildings managers to operate safe, as well as functional buildings. Candidates should be encouraged to identify the personnel, tools, equipment and consumables and other materials needed for effective planned maintenance. Despite good maintenance, buildings and equipment may still fail, hence the outcome should also investigate what managers can do to mitigate the effects of such unscheduled breakdowns in functionality.

Guidance on the delivery and assessment of this unit

The unit is specifically designed for use as part of SQA Advanced Certificate in Poultry Production (GN25 47) and it is best studied in this context, though it would have applicability for other industries that use similar agricultural buildings. The unit is expected to be delivered primarily in a classroom environment. However, every opportunity should be sought to investigate buildings and equipment in a working environment or, failing this, to use models and simulations. It would be particularly advantageous to make extensive use of visits to different building types to see different lighting heating and ventilation schemes and note the similarity of control systems for each of the different parameters. The opportunity to make adjustments and measure the effects could strengthen understanding of the more complex concepts such as proportional control systems. The use of practical exercises, for example to study the pressure flow relationship of pumps and fans, is highly recommended to aid comprehension. Similarly visits to feed mills both farm scale and commercial could be an important aid to understanding the scale of operations required.

The bulk of the assessment of the unit is associated with Outcomes 1, 2 and 3 and could be largely through the medium of an assignment. The candidate could be given a desired outcome — for example to produce 60,000 meat birds annually, and from this they could determine the buildings features required and hence the development constraints that would be evident. The environmental control system would become apparent and so would the feed requirements and from this appropriate feed and water delivery systems can be proposed. Alternatively each outcome could be treated separately and different scenarios used for each. By contrast Outcome 4 is predominantly concerned with building management and as this should be known rather than looked up in references, it is more appropriate to use a closed-book assessment for this outcome.

Opportunities for developing core skills

The evaluation of heat and moisture balances in Outcome 2, the use of design data, consideration of failsafe equipment and the specification of a pump/fan all mean there is ample opportunity to develop the core skill of *Numeracy* at SCQF level 6 in this unit (both components).

Open learning

It is possible for this unit to be completed by distance learning. Candidates will ideally require access to suitable poultry buildings to appreciate site issues and familiarise themselves with building features and the equipment they contain. The assessments could be completed on-line. Outcomes 1, 2 and 3 will require a suitable scenario or scenarios to be prepared.

Equality and inclusion

This unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on our website www.sqa.org.uk/assessmentarrangements.

General information for candidates

Unit title: Poultry Buildings and Mechanisation

The poultry industry is highly dependent on the use of very sophisticated buildings, particularly for intensive production systems. In this unit you will study many aspects of these buildings from the initial site selection through to the equipment that is found inside the most common building types. The unit will introduce you to the planning, building control and other regulatory issues to be considered in the establishment of a poultry building, the structure and fabric of the building to ensure it is capable of providing the required environmental conditions for the stock, and the internal services for the building. Consideration is given to the control of the environment through a study of the important aspects from fans, to the characteristics of the control systems.

Poultry production, however, is concerned not just with the building, but also the equipment for feeding and watering the stock. Consequently you will also consider the main elements of feed production and distribution equipment; the available options, and how well they match the requirements of the birds. Similarly, you will investigate the distribution of water to stock and this may include consideration of the sources of water and the need for water treatment.

Finally both buildings and equipment will inevitably break down at some point and so you will consider the implications for the stock and the failsafe measures that can be employed. In order to minimise the need for these expensive systems, buildings and equipment require maintenance in order to continue to function correctly and the unit is concluded by considering the management of needs with regard to maintenance.

This unit is assessed using two instruments of assessment. Outcomes 1, 2 and 3 are assessed using an assignment and restricted response questions. Outcome 4 is assessed by means of a separate, open-book assignment.

There are opportunities to develop the core skill of *Numeracy* at SCQF level 6 in this unit.