



## Higher National Unit specification

### General information for centres

**Unit title:** Roofing: Solar Collection Systems

**Unit code:** F8N5 34

**Unit purpose:** This Unit is designed to enable candidates to develop a knowledge, understanding and skills of solar technological concepts and elements used in roofing, enabling them to work with Accredited Installers of solar technology. The Unit begins with roof inspection with a focus on the suitability and structural consideration for installing solar technology. Candidates will then be expected to carry out a practical installation of a solar collector system up to the handover point – Internal connection or commissioning must only be carried out by an Accredited Installer.

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

- 1 Analyse and explain a roof's structural considerations and suitability for new solar technology.
- 2 Demonstrate knowledge and understanding of roof integrated and roof mounted solar collectors.
- 3 Install a solar collector system and reinstate roof covering.
- 4 Specify the methods used for maintaining Health and Safety requirements for roof work.

**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 will be at the discretion of the centre. It would be beneficial if candidates have successfully completed the Professional Development Award (PDA) in Roof Slating, Tiling and Cement Work at SCQF level 6 (G9GG 46) or have the equivalent level of industrial experience and prior learning.

**Core Skills:** There are opportunities to develop the Core Skills of *Problem Solving, Numeracy, Working with Others, and Communication* at SCQF level 5 and *Information and Communication Technology* at SCQF level 4 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. This Unit was developed as part of the Professional Development Award in Roof Slating and Tiling at SCQF level 7 and is aimed at candidates following a career in Roofing and receiving complementary industrial experience.

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

### **Unit title:** Roofing: Solar Collection Systems

**Assessment:** It is possible to assess candidates either on an individual Outcome basis or combinations of Outcomes. Information from a roof inspection is to be collated and analysed to create a report on the suitability for installing a solar panel system to a roof surface. The candidates should develop a knowledge and understanding of basic solar systems used in the industry including Health and Safety requirements when inspecting or installing at height.

The assessment instruments used should follow the general guidance offered by the Scottish Qualifications Authority (SQA) assessment model and an integrative approach to assessment is encouraged. Centres may use the instruments of assessment which they consider to be most appropriate but are advised to use the Roof Slating and Tiling Training and Assessment Programme (TAP) SCQF level 7 which has been developed centrally by SQA. Any other instruments of assessment used must be comparable to the TAP 7.

Accurate records should be made of the assessment instruments used showing how evidence is generated for each Outcome and given marking schemes, checklists and recorded candidate feedback. Records of candidates' achievements should be retained. These records must be made available for external verification.

### **Outcome 1, 2 and 4**

The assessment paper(s) for these Outcomes should be composed of an appropriate balance of completing written report, short answer, restricted response and structured questions. Assessment should be conducted under open-book, supervised, controlled conditions. Written assessment should not exceed three hours in duration.

### **Outcome 3**

The assessment for this Outcome involves the practical installation of a solar collector system to a previously tiled or slated roof covering. Candidates should correctly reinstate the roof and check roof installation is water-tight. The installing of the system by the candidate is up to the hand over point where a qualified plumber or electrician who would complete the installation, safety check and sign off for the final commissioning of the system.

## Higher National Unit specification: statement of standards

**Unit title:** Roofing: Solar Collection Systems

**Unit code:** F8N5 34

The sections of the Unit stating the Outcomes, Knowledge and/or Skills, and Evidence Requirements are mandatory.

### Outcome 1

Analyse and explain a roof's structural considerations and suitability for new solar technology

#### Knowledge and/or Skills

- ◆ Investigation
- ◆ Analysis
- ◆ Timber condition
- ◆ Roof pitch
- ◆ Roof orientation
- ◆ Waterproofing membrane
- ◆ Thermal insulation
- ◆ Roof covering
- ◆ Shading
- ◆ Loft Space
- ◆ Roof area requirement
- ◆ Accredited Installer Scheme

#### Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can investigate, analyse and consider the suitability of a given roof for installing new solar technologies. Candidates must compile a written report on the suitability of the roof for new technology installation incorporating all knowledge and/or skill items in the final report. All information and conclusions in the report must be in accordance with current British Standards and Codes of Practice.

Evidence must be gathered under open-book controlled, supervised conditions. Candidates may bring to the event any notes that they have made personally. They must have access to the relevant manufacturer guidelines and information for the product to be used on the roof.

#### Assessment Guidelines

Assessment of the knowledge and skills in this Outcome could take the form of a project for which a roof is to be investigated and analysed. Candidates would use the information and specification in the project brief to create a report on the roof's suitability for new technology installation.

The assessment for this Outcome might be combined with that for Outcomes 2 and 4.

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

**Unit title:** Roofing: Solar Collection Systems

### **Outcome 2**

Demonstrate knowledge and understanding of roof integrated and roof mounted solar collectors

#### **Knowledge and/or Skills**

- ◆ Renewable energy resource
- ◆ Methods of producing renewable energy
- ◆ Benefits of solar energy
- ◆ Solar collector orientation and tilt
- ◆ Flat-Plate thermal solar collectors
- ◆ Evacuated Tube thermal solar collectors
- ◆ Solar electric modules
- ◆ Installation methods

#### **Evidence Requirements**

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

- ◆ describe common types of and uses for solar power
- ◆ state the benefits of solar as a renewable energy resource
- ◆ describe the basic requirements for the installation of roof integrated and roof mounted solar collectors
- ◆ illustrate by an annotated sketch the thermal system concepts used for solar collectors
- ◆ illustrate by an annotated sketch the light system concepts used for solar collectors

In any assessment of this Outcome all Knowledge and/or Skills items should be included. Candidates must provide a satisfactory response to all items.

Evidence must be generated under open-book, supervised conditions.

#### **Assessment Guidelines**

Questions used to elicit candidate's evidence should take the form of an appropriate balance of annotated sketches, short answer, restricted response and structured questions.

The assessment for this Outcome might be combined with that for Outcomes 1 and 4.

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

**Unit title:** Roofing: Solar Collection Systems

### Outcome 3

Install a solar collector system and reinstate roof covering

#### Knowledge and/or Skills

- ◆ Interpretation of manufacturer's instructions
- ◆ Roof structures and their suitability for new solar technology
- ◆ Roof coverings and their compatibility with new solar technology
- ◆ Calculation of areas
- ◆ Health and Safety controls
- ◆ Roof preparation
- ◆ Solar collector installation

#### Evidence Requirements

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

##### Planning

- ◆ interpret given information from manufacturer's instructions
- ◆ confirm roof structure suitability
- ◆ confirm roof covering compatibility
- ◆ correctly calculate required area for system installation
- ◆ ensure health and safety controls are appropriate

##### Preparation

- ◆ check installation pack
- ◆ measure area for installation
- ◆ safely remove tiles/slates for panels/brackets
- ◆ check batten gauge
- ◆ check equipment and tools

Install **one** of the following solar collector systems in line with manufacturer guidance and current British Standards:

- ◆ solar electric modules
- ◆ solar thermal flat panels: mounted or integrated
- ◆ solar thermal evacuated tube: mounted or integrated

Check and ensure weather tightness

- ◆ check tile interlock
- ◆ check flashings
- ◆ check for roof damage

The system must only be installed to the handover point for a qualified plumber or electrician. Full commissioning will require a final sign off by the Accredited Installer.

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

### **Unit title: Roofing: Solar Collection Systems**

All Knowledge and/or Skills items must be evidenced. An assessor observation checklist should be completed to ensure that the candidate has met the required specification and manufacturer guidelines and this observation checklist should be retained as evidence. Evidence must be gathered under controlled, supervised conditions.

#### **Assessment Guidelines**

The assessment of this Outcome is based on the preparation of a previously tiled or slated roof surface and the practical installation of a solar collector system following the manufacturer's instructions. Candidates should be observed and assessed against the standard identified in the Evidence Requirements.

### **Outcome 4**

Specify the methods used for maintaining Health and Safety requirements for roof work

#### **Knowledge and/or Skills**

- ◆ Working at height
- ◆ Working with live solar electric modules
- ◆ Risk assessment
- ◆ Method statements
- ◆ Manual handling
- ◆ Health and Safety regulations

#### **Evidence Requirements**

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

- ◆ correctly adhere to current health and safety methods and activities in terms of working at height
- ◆ undertake a risk assessment
- ◆ explain requirements for a method statement
- ◆ correctly adhere to current health and safety methods and activities in terms of working with live solar electric modules
- ◆ correctly adhere to current health and safety methods and activities in terms of manual handling
- ◆ correctly adhere to current health and safety methods and activities in terms of controlling substances hazardous to health

In any assessment of this Outcome all Knowledge and/or Skills items should be included. Candidates must provide a satisfactory response to all items.

Evidence must be generated under open-book, supervised conditions

#### **Assessment Guidelines**

Questions used to elicit candidate's evidence should take the form of an appropriate balance of annotated sketches, short answer, restricted response, structured questions and completion of a Risk Assessment.

The assessment for this Outcome might be combined with that for Outcomes 1 and 2.

## Administrative Information

**Unit code:** F8N5 34

**Unit title:** Roofing: Solar Collection Systems

**Superclass category:** TG

**Original date of publication:** August 2010

**Version:** 01

### History of changes:

Version	Description of change	Date

**Source:** SQA

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## Higher National Unit specification: support notes

### Unit title: Roofing: Solar Collection Systems

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 has been developed as an optional Unit in the Professional Development Award (PDA) in Roof Slating and Tiling at SCQF level 7.

This Unit is intended to equip candidates with all necessary underpinning knowledge and skills related to new technologies in roofing and installing a solar collection system.

At the time of writing the following applies, although centres must ensure the most up to date standards and legislation are adhered to:

- ◆ BS 5534: the British Standard Code of practice for slating and tiling
- ◆ BS 8000: Part 6: the British Standard Code of practice for workmanship on building sites.
- ◆ Working at Height Regulations 2005
- ◆ Manual Handling Operations Regulations 1992
- ◆ COSHH 1992
- ◆ IEE Wiring Regulations (BS 7671:2008)

The following information may be helpful in relation to specific Outcomes:

#### **Outcome 1: Analyse and explain the roofs structural considerations and suitability for new technology** (Recommended 10 hours)

- ◆ **Roof inspection**
  - condition of supporting timbers (rafters and joists) and roof covering
  - suitability for new technologies: roof shape and type of covering
  - roof pitch (determine the roof inclination by pitch indicator and calculation)
  - roof orientation (ascertain the roof surface for best performance)
  - condition of underlay and battening
  - condition of roof covering
  - shading (trees, dormer windows, chimneys, aerials)
  - loft space (access, use, clearance requirements)
  - determination of roof area requirements
- ◆ **Report based on roof inspection**
  - condition of roof
  - suitability for installing a solar panel system
  - recommendations for installation
  - the requirement for accredited installers to make the final connections and checks for the commissioning of the solar system



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

**Unit title:** Roofing: Solar Collection Systems

**Outcome 2: Have a knowledge and understanding of roof integrated and roof mounted solar connectors** (Recommended 10 hours)

- ◆ **Types of renewable energy resource**
  - types and methods used for producing renewable energy
  - benefits of solar energy (a renewable energy source, environment considerations, carbon emissions, cost effectiveness, low maintenance, non-polluting,
  - solar collector orientation and tilt for overall system efficiency
- ◆ **Types of Solar collectors (Thermal)**
  - basic requirements for the installation of a flat-plate solar collector
  - basic requirements for the installation of a evacuated tube solar collector
  - use of manufacturer's instructions for installations
- ◆ **Solar collectors (Light)**
  - how a solar electric modules works
  - basic requirements for the installation of solar electric modules
  - use of manufacturer's instructions for installations

**Outcome 3: Install a solar collector system and reinstatement to the roof covering** (Recommended 10 hours)

- ◆ **Initial planning requirements for installation**
  - source and interpret information for installation
  - inspect roof structure (defects in timber work, roof covering compatibility, roof size, pitch, orientation)
  - calculation of required area for system installation (use of manufacturer's data sheets,
  - certify health and safety requirements for installing solar panels (working at height, manual handling, COSHH)
- ◆ **Preparation prior to installation**
  - inspection of system contents (number of panels, fixings, connectors and fitting instructions)
  - area of installation (position for the installation of panels, total length and height of panels, position of cable or pipes through roof)
  - remove area of tiles or slates for the installation of solar panels (solar electric modules or integrated solar system)
  - identify and position tile or slate for fitting roof connectors (mounted solar system)
  - verify batten spacing is acceptable for the installation (within maximum and minimum gauge)
  - check all necessary equipment and tools are on hand for safe installation
  - equipment and scaffold suitability for the handling of the solar panels
- ◆ **Installation of a solar system**
  - safety precautions (cover panels prior to installation, preassemble short hoses and dummy plugs as necessary)
  - position and fix brackets and rails (mounted)
  - position and fix brackets and/or flashings (integrated)
  - position and fit panels (secure collector against falling, stabilise the collector array)
  - position and fix panels (solar electric module)s

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

### Unit title: Roofing: Solar Collection Systems

- connect panels (solar hoses or colour coded cables)
- check fittings and connections (position, secure)

#### ◆ Final inspection

- check integration of solar panel to the tile interlocks
- check all flashings are fitted correctly to form a watertight junction between panel and roof covering
- check and repair damage to roof covering (missing and /or broken tiles, slates)
- hand over to the accredited installer

Candidates should be encouraged to work in teams for the initial planning, preparation, installation, reinstatement of the system. The final inspection of the system to the handover point could be peer assessed and verified with assessor.

### Outcome 4: Specify the methods used for maintaining Health and Safety requirements for roof work (Recommended 10 hours)

#### ◆ Health and Safety requirements

- current work at height regulations
- requirements for working with live solar electric modules
- requirements for existing places of work or means of access or egress
- guard-rails, toe-boards, barriers or similar collective means of protection.
- requirements for working platforms
- suitability of the scaffold for handling solar panels
- requirements for collective safeguards for arresting falls
- requirements for personal fall protection system
- requirements for ladders
- particulars to be included in a report of inspection

#### ◆ Risk Assessment

- what is a risk assessment?
- completion of a risk assessment: task description, location, completion date, review date, persons affected individuals or groups, hazards/consequences, identifying existing control procedures, risk ranking

#### ◆ Method Statements

- what is a method statement?
- requirements of a method statement: task description, preparation, installation, commissioning, testing and handover, information sources

#### ◆ Manual Handling

- avoiding hazards
- assessing hazards
- reducing the risk of injury

#### ◆ Control of Substances Hazardous to Health (COSHH)

- what is covered?
- what are the main obligations?
- define good control practices

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

### **Unit title: Roofing: Solar Collection Systems**

Health and Safety and Sustainability are integral and key to the construction industry therefore throughout the Unit emphasis will be placed where appropriate on the application of Health and Safety and Sustainability. Safe working practices should be looked at in accordance with current safety codes of practice and regulations. Sustainability should include reference to criteria affecting sustainability, impact of not implementing sustainability on the environment and the legislation promoting sustainability.

Emphasis should be placed on appropriate areas such as waste management and effective sourcing and use of materials.

Where feasible, centres should also incorporate modern methods of construction used in industry. Candidates should be made aware of current industry practice and emerging practice or technology which may become conventional in the future.

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

As part of the Professional Development Award (PDA) in Roof Slating and Tiling at SCQF level 7, this Unit may be delivered in a sequence suitable to individual candidates and centres. When completing this Unit as part of the PDA it is recommended that, where possible, opportunity is taken to integrate aspects of Constructional Technical Communication Skills (DW4D 34). This Unit could also be delivered as a free standing Unit.

This Unit builds on the knowledge and understanding of roofing skills gained in the Roof Slating, Tiling and Cement Work PDA at SCQF level 6. It is recommended that evidence for the Outcomes is achieved through well-planned course work, assignments and projects. Assessment may be formative and summative and both may feature as part of the process. Although assessments must be focused on the individual achievement of each candidate, group work may contribute to the assessment. Integrative assignments and project work will help to link this Unit with other Units in the Roof Slating and Tiling PDA at SCQF level 7.

If feasible, site visits or information about modern and potential future methods of construction would be beneficial. This approach could be used to enhance the candidate's experience and understanding of how their skills and knowledge might be applied in real industry situations.

Centres may use the instruments of assessment which they consider to be the most appropriate but are advised to use the Roof Slating and Tiling Training and Assessment Programme at SCQF level 7 (TAP 7) which has been developed centrally by SQA. Any other instruments of assessment used must be comparable to the TAP.

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 essential that these sections be read carefully before proceeding with assessment of candidates.

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

**Unit title:** Roofing: Solar Collection Systems

### *Opportunities for developing Core Skills*

The Core Skills of *Problem Solving* at SCQF level 5 could be developed for Outcomes 1, 3 and 4 through analysing a range of factors in order to work efficiently and safely, such as the suitability and condition of the roof, choice of tools and equipment, appropriate materials and type of solar systems, safety issues, safety equipment and sustainability. Individual discussions with assessors and the use of role play will enhance the evaluation of efficient working practices.

The Core Skill of *Numeracy* at SCQF level 5 could be developed for Outcomes 2 and 3 through roofing calculations for area and material estimating.

There are opportunities for candidates to develop the Core Skill of *Working with Others* at SCQF level 5 through working in pairs for Outcome 3. Candidates can agree responsibilities and provide support and information to each other during the practical group activities. Further opportunities could be developed through working with the (accredited installer) plumber or electrician.

Candidates will have the opportunity to develop the Core Skill of *Communication* at SCQF level 5 throughout practical tasks, as they should be expected to communicate with others using the correct terminology, tone and style suited to the workplace.

Opportunities also arise for candidates to develop the Core Skill of *Information and Communication Technology* at SCQF level 4 for Outcome 1 and 4 through researching new technologies, terminology and techniques used in roofing on the internet, word processing for report writing, spreadsheets for materials information, e-learning and e-assessment.

### Core Skills Signposting

Core Skill	Outcome 1	Outcome 2	Outcome 3	Outcome 4
<b>1 Communication</b>				
Reading	SCQF 5	SCQF 5		
Writing	SCQF 5	SCQF 5		
Oral	SCQF 5	SCQF 5		
<b>2 Numeracy</b>				
Using Number		SCQF 5	SCQF 5	
Using Graphical Information		SCQF 5	SCQF 5	
<b>3 ICT</b>				
Using Information Technology	SCQF 4			SCQF 4
<b>4 Problem Solving</b>				
Critical Thinking	SCQF 5		SCQF 5	SCQF 5
Planning and Organising	SCQF 5		SCQF 5	SCQF 5
Reviewing and Evaluating	SCQF 5		SCQF 5	SCQF 5
<b>5 Working with Others</b>			SCQF 5	

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

**Unit title:** Roofing: Solar Collection Systems

### Open learning

Although this Unit could be delivered by distance learning, it would require a considerable degree of planning by the centre to ensure the sufficiency and authenticity of candidate evidence. Arrangements would have to be made to ensure that:

- ◆ candidates have access to a suitable workshop with suitable equipment and tools
- ◆ health and safety considerations are fully taken into account
- ◆ the practical activities are supervised by a responsible person and clearly recorded (using an assessment checklist for the assessor)
- ◆ the assessor is, at some point, able to question the candidate on that performance
- ◆ assessment is carried out under the stated conditions

For information on open learning arrangements, please refer to the SQA guide *Assessment and Quality Assurance of Open and Distance Learning* ([www.sqa.org.uk](http://www.sqa.org.uk))

### Disabled candidates and/or those with additional support needs

The 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 whether any reasonable adjustments may be required. Further advice can be found on our website [www.sqa.org.uk/assessmentarrangements](http://www.sqa.org.uk/assessmentarrangements)

## General information for candidates

### Unit title: Roofing: Solar Collection Systems

This Unit has been designed to further your career in the construction industry by developing your competence and improving your knowledge of solar collection systems. It has been written as part of the Professional Development Award (PDA) in Roof Slating and Tiling at SCQF level 7, and is for experienced crafts persons working in the construction industry as roofers.

The Unit will help develop your underpinning knowledge and skills related to solar roofing technologies, considerations for an appropriate solar collection system for a particular roof and will also require you to install a solar collection system up to the point it is handed over to a qualified plumber or electrician. You will also focus on Health and Safety considerations.

On completion of the Unit you should be able to:

- 1 Analyse and explain a roof's structural considerations and suitability for new solar technology.
- 2 Demonstrate knowledge and understanding of roof integrated and roof mounted solar collectors.
- 3 Install a solar collector system and reinstatement the roof covering.
- 4 Specify the methods used for maintaining Health and Safety requirements for roof work.

You will be assessed on your knowledge and understanding through open-book, supervised assignments and projects when you will need to refer to textbooks, handouts, manufacturer data sheets and instruction manuals.

You will also be assessed on your practical ability to install a solar collection system. Your assessor will observe what you do and how well you install the system to meet the manufacturer guidelines.

There are opportunities for you to develop the Core Skills of *Problem Solving, Numeracy, Working with Others, and Communication* at SCQF level 5 and *Information and Communication Technology* at SCQF level 4 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

If you successfully complete this Unit and the full PDA at SCQF level 7, you will not only have advanced your craft skills, but will automatically receive some credit if you progress on to the HNC Construction.