

# Scottish Qualifications Authority

## Workplace Assessed Unit Specification

### General information

**Unit Number** F8XK 04 **Publication date:** June 2010

**Title** Install, Test, Commission and Handover Solar Thermal Hot Water Systems

#### **GENERAL COMPETENCE FOR UNIT:**

The aim of this Unit is to allow candidates to develop the knowledge and skills required to install commission and handover fully-filled and drainback solar thermal hot water systems. The emphasis is upon 'active' systems but the Unit also includes some content relating to 'passive' systems. The Unit also covers fundamental design techniques but does not cover detailed design. The Unit covers systems for domestic hot water production only. The Unit focuses upon systems with up to 20m<sup>2</sup> of solar collector area.

#### **OUTCOMES**

- 1 Identify and describe the requirements to install, commission and handover solar thermal hot water systems
- 2 Install, commission and handover solar thermal hot water systems

#### **ACCESS STATEMENT:**

Access to this Unit is subject to the following pre-requisites:

Candidates must be qualified in an appropriate Mechanical Engineering Services or Building Services Engineering discipline to SVQ level 3 or equivalent and must have achieved the Unit F8XJ 04: Working Principles, Installation Options and Regulatory Requirements for Micro-Renewable Technologies, Water Harvesting and Recycling Technologies.

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# Workplace Assessed Unit Specification

## Statement of standards

**UNIT NUMBER:** F8XK 04

**UNIT TITLE:** Install, Test, Commission and Handover Solar Thermal Hot Water Systems

Acceptable performance in this Unit will be the satisfactory achievement of the standards set out in this part of the Unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to the Scottish Qualifications Authority.

### OUTCOME 1

Identify and describe the requirements to install, commission and handover solar thermal hot water systems

### PERFORMANCE CRITERIA

- (a) Identify the health and safety risks and safe systems of work associated with solar thermal hot water system installation work
- (b) Identify the requirements of relevant regulations/standards relating to practical installation, testing and commissioning activities for solar thermal hot water system installation work
- (c) Describe the types and layouts of solar thermal hot water system that incorporate a sealed collector circuit
- (d) Describe the purpose of components used within solar thermal hot water system installations
- (e) Identify and describe the types and key operating principles of solar collectors
- (f) Identify the information requirements to enable system component selection and sizing
- (g) Identify the fundamental techniques used to select, size and position components for solar thermal hot water systems
- (h) Describe how the performance of solar hot water systems is measured
- (i) Identify the preparatory work required for solar thermal hot water system installation work
- (j) Describe the requirements for connecting solar thermal hot water system collector circuits to combination boiler domestic hot water circuits
- (k) Identify the requirements for installing solar collector arrays
- (l) Identify the requirements for installing for solar thermal hot water system pipework
- (m) Identify the requirements to test and commission solar thermal hot water system installations
- (n) Identify the requirements to handover solar thermal hot water systems.

# Workplace Assessed Unit Specification

## Statement of standards (cont)

**UNIT NUMBER:** F8XK 04

**UNIT TITLE:** Install, Test, Commission and Handover Solar Thermal Hot Water Systems

### RANGE STATEMENT

(a) Clarify which aspects of solar thermal hot water system installation work pose risk of:

- ◆ electrocution/electric shock
- ◆ burns
- ◆ toxic poisoning
- ◆ injury through flash to steam of system heat transferfluid
- ◆ a fall from height
- ◆ personal injury though component/equipment handling

(EVTS 1, Kn c)

Propose safe systems of work for solar thermal hot water system installation work in relation to prevention of:

- ◆ electrocution/electric shock
- ◆ burns
- ◆ toxic poisoning
- ◆ injury through flash to steam of system heat transferfluid
- ◆ a fall from height
- ◆ personal injury though component/equipment handling

(EVTS 1, Kn c)

(b) Interpret building regulation/building standards guidance documentation as relevant to solar thermal hot water system installation work to identify the requirements in relation to:

- ◆ maintaining the structural integrity of the building
- ◆ maintaining the fire resistant integrity of the building
- ◆ the prevention of moisture ingress (building water tightness)
- ◆ notification of work requirements
- ◆ control of temperature in primary and secondary circuits including primary circuits connected to unvented hot water storage systems
- ◆ energy conservation
- ◆ testing and commissioning requirements
- ◆ compliance certification

(EVTS1, Kn b)

# Workplace Assessed Unit Specification

## Statement of standards (cont)

**UNIT NUMBER:** F8XK 04

**UNIT TITLE:** Install, Test, Commission and Handover Solar Thermal Hot Water Systems

Interpret industry recognised water regulation/byelaw guidance documentation as relevant to solar thermal hot water system installation work to identify the requirements in relation to:

- ◆ prevention of contamination of the wholesome water supply
- ◆ energy conservation
- ◆ safe operation
- ◆ testing and commissioning requirements

(EVTS1, Kn b)

(c) Identify the following indirect solar thermal hot water systems types:

- ◆ Fully filled (active)
- ◆ Drainback (active)
- ◆ Passive (thermosiphon)

Identify the following solar thermal hot water system storage vessel types and arrangements:

- ◆ Indirect, sealed collector circuit, Domestic Hot Water storage cylinder only (solar primary coil only)
- ◆ Indirect, sealed collector circuit, Domestic Hot Water storage cylinder only (dual coil)
- ◆ Indirect, sealed collector circuit, pre-heat cylinder and Domestic Hot Water storage cylinder
- ◆ Indirect, sealed collector circuit, thermal store

(EVTS2, Kn c)

(d) Clarify the purpose of the following solar thermal hot water system components:

- ◆ Differential temperature controller
- ◆ Cylinder sensor(s)
- ◆ Solar collector sensor
- ◆ Drain back vessel
- ◆ Flow meter
- ◆ Flow regulator (mechanical)
- ◆ Expansion vessel

(No specific NOS reference but linked to EVTS2, Kn c)

# Workplace Assessed Unit Specification

## Statement of standards (cont)

**UNIT NUMBER:** F8XK 04

**UNIT TITLE:** Install, Test, Commission and Handover Solar Thermal Hot Water Systems

(e) Identify the following types of solar collector:

- ◆ unglazed collector
- ◆ flat plate glazed collector
- ◆ roof integrated glazed collector
- ◆ evacuated tube collector — direct flow
- ◆ evacuated tube collector — heat pipe

(No specific NOS reference but linked to EVTS2, Kn c)

Clarify the key operating principles for:

- ◆ flat plate collectors
- ◆ evacuated tube collector — direct flow
- ◆ evacuated tube collector — heat pipe

(No specific NOS reference)

Determine the effect that the temperature difference between the solar primary circuit/collector temperature and the ambient temperature has on the relative efficiency of the following types of solar collector:

- ◆ unglazed collector
- ◆ flat plate glazed collector
- ◆ evacuated tube collector

(No specific NOS reference but linked to M8, Kn i)

(f) Clarify the information requirements in relation to:

- ◆ building design
- ◆ building dimensions/angles
- ◆ building location and orientation
- ◆ building fabric/material details
- ◆ existing input services
- ◆ existing hot water/heating systems

Clarify the requirements of information in relation to:

- ◆ building occupancy
- ◆ required hot water usage pattern

## Workplace Assessed Unit Specification

### Statement of standards (cont)

**UNIT NUMBER:** F8XK 04

**UNIT TITLE:** Install, Test, Commission and Handover Solar Thermal Hot Water Systems

(g) Clarify how to determine typical domestic hot water system storage vessel requirements in relation to:

- ◆ Daily demand ( $V_d$ ) (litres/day per person or litres/day per  $m^2$  of floor area)
- ◆ Boiler volume ( $V_b$ )
- ◆ Dedicated solar volume ( $V_s$ ) (litres per  $m^2$  of collector area or as a % of  $V_d$ )
- ◆ Total cylinder volume ( $V_t$ )
- ◆ Solar heat exchange coil surface area ( $m^2$  of surface area in relation to collector flow rate and collector surface area)

(M8, Kn i)

Clarify how to determine typical domestic hot water system collector area requirements in relation to:

- ◆ building occupancy
- ◆ proposed angle of collector installation
- ◆ proposed orientation of collector installation
- ◆ Shading that may affect collector performance

Clarify how to determine the annual irradiation yield as a % of optimum in relation to:

- ◆ collector orientation
- ◆ collector angle
- ◆ collector over shading

(M8, Kn i)

Clarify recommended solar primary circuit circulation rates

(M8, Kn i)

Clarify how to determine solar primary circuit pipe size requirements in relation to:

- ◆ primary circuit circulation rates
- ◆ collector area
- ◆ primary circuit pipework length

(M8, Kn i)

# Workplace Assessed Unit Specification

## Statement of standards (cont)

**UNIT NUMBER:** F8XK 04

**UNIT TITLE:** Install, Test, Commission and Handover Solar Thermal Hot Water Systems

Clarify how to determine total solar primary circuit water content volume

(M8, Kn i)

Clarify how to determine total solar primary circuit expansion vessel size requirements in relation to:

- ◆ primary circuit water content volume
- ◆ collector height above cylinder

(M8, Kn i)

Clarify typical sizing requirements for drainback vessels in relation to:

- ◆ net collector area
- ◆ total volume of the system

(M8, Kn i)

Clarify how to determine solar primary circuit dynamic pressure drop and circulating pump size requirements for:

- ◆ fully filled systems
- ◆ drainback systems

(M8, Kn i)

(h) Define the meaning of the term 'solar fraction'  
Identify factors that affect the solar fraction

(i) State the requirements in relation to:

- ◆ authorisation for the work to proceed
- ◆ the availability of appropriate access to all required work areas

(EVTS 1, Kn d,e)

# Workplace Assessed Unit Specification

## Statement of standards (cont)

**UNIT NUMBER:** F8XK 04

**UNIT TITLE:** Install, Test, Commission and Handover Solar Thermal Hot Water Systems

Clarify the requirements of pre-installation checks in relation to:

- ◆ the suitability of the proposed location and position of the solar collector(s) for optimum collection capacity
- ◆ the suitability of the building structure and the building fabric in relation to the installation of system components
- ◆ verification that the generation capacity of the proposed solar hot water system installation is appropriate to the hot water system energy load and usage
- ◆ the inspection of existing hot water/heating system installations
- ◆ water quality
- ◆ the availability of a suitable electrical input service
- ◆ the proposed siting of key internal system components

(EVTS 1, Kn d,e)

- (j) Clarify how to determine the suitability of combination boilers to receive pre-heated water.

(EVTS2, Kn c)

Clarify the pipework layout and components required for connecting a solar thermal hot water system to a combination boiler to include the:

- ◆ arrangements for prevention of backflow
- ◆ arrangements for ensuring that the combination boiler cold inlet supply water is provided at an appropriate temperature
- ◆ arrangements for allowing stored hot water to be used directly from the store when the temperature of the stored water is appropriate

(EVTS2, Kn c)

- (k) Clarify the positioning and fixing requirements and where appropriate the weathering requirements for the following solar collector types:

- ◆ Flat plate, surface mounted, inclined roof with single lap roof covering
- ◆ Flat plate, surface mounted, inclined roof with double lap roof covering
- ◆ Flat plate, integrated, inclined single lap roof covering
- ◆ Flat plate, integrated, inclined double lap roof covering
- ◆ Evacuated tube, inclined single lap roof covering
- ◆ Evacuated tube, inclined double lap roof covering
- ◆ Frame mounted, inclined (roof, wall or ground)
- ◆ Frame mounted, horizontal (roof or ground)

(EVTS2, Kn c)



# Workplace Assessed Unit Specification

## Statement of standards (cont)

**UNIT NUMBER:** F8XK 04

**UNIT TITLE:** Install, Test, Commission and Handover Solar Thermal Hot Water Systems

Clarify the pipework layout, component requirements and component positioning requirements for the following system types and collector array connection arrangements:

- ◆ fully filled system, collector array connected in series
- ◆ fully filled system, collector array connected in parallel
- ◆ fully filled system, collector array connected with east/west split
- ◆ drainback system, single collector array

(EVTS2, Kn c)

Clarify the requirements to achieve durable weather-tightness of buildings where collector array connection pipework passes through the building fabric.

(EVTS2, Kn c)

State when specialist equipment is required in relation to preventing irradiation reaching collector absorbers during installation.

(l) Propose suitable pipework materials in relation to:

- ◆ system operating temperatures
- ◆ system operating pressures
- ◆ system chemicals

(EVTS2, Kn c)

Clarify the requirements for pipework supports:

- ◆ suitable materials
- ◆ spacing of pipework supports

(EVTS2, Kn c)

Propose suitable pipework jointing methods in relation to:

- ◆ system operating temperatures
- ◆ system operating pressures
- ◆ system chemicals

(EVTS2, Kn c)

# Workplace Assessed Unit Specification

## Statement of standards (cont)

**UNIT NUMBER:** F8XK 04

**UNIT TITLE:** Install, Test, Commission and Handover Solar Thermal Hot Water Systems

Clarify the requirements for pipework insulation for solar thermal hot water system installation work in relation to:

- ◆ system operating temperatures
- ◆ system efficiency and performance
- ◆ potential exposure of the insulation to ultra-violet rays/light
- ◆ potential exposure of the insulation to adverse weather
- ◆ the sections of installations that must be insulated
- ◆ the sections of installations that must not be insulated

(EVTS2, Kn c)

Clarify the requirements for installing pressure relief valve discharge pipework:

- ◆ routing of pipework
- ◆ termination of pipework

(m) Clarify the requirements to prepare for testing and commissioning in relation to:

- ◆ compliance with the system design and specification
- ◆ compliance with system/component manufacturer requirements
- ◆ suitability of electrical supply circuit arrangements
- ◆ flushing the system of installation debris
- ◆ selection of suitable heat transfer fluid
- ◆ filling and venting the hydraulic circuits
- ◆ checking system water quality
- ◆ protection against freezing
- ◆ provision of system labeling

(EVTS3, Kn a, b, EVTS 4 Kn b)

State what specialist equipment is required in relation to:

- ◆ the introduction and checking of system freeze protection fluids
- ◆ setting system pressure
- ◆ checking the corrosion protection of the system

Clarify the testing requirements for hydraulic circuits within solar thermal hot water system installations in relation to:

- ◆ hydraulic test pressure
- ◆ hydraulic test duration

(EVTS3, Kn a, b)

## Workplace Assessed Unit Specification

### Statement of standards (cont)

**UNIT NUMBER:** F8XK 04

**UNIT TITLE:** Install, Test, Commission and Handover Solar Thermal Hot Water Systems

Clarify the commissioning requirements for a fully-filled indirect sealed collector circuit installation in relation to:

- ◆ setting of the expansion vessel charge pressure
- ◆ setting of the system fluid level
- ◆ setting of mechanical controls
- ◆ setting of electrical controls and temperature sensors
- ◆ system functional tests

(EVTS4, Kn b)

Clarify the commissioning requirements for a fully-filled drainback installation in relation to:

- ◆ setting of the system fluid level
- ◆ setting of mechanical controls
- ◆ setting of electrical controls and temperature sensors
- ◆ system functional tests

(EVTS4, Kn b)

Clarify the commissioning requirements for multiple collector arrays connected in series

(EVTS4, Kn b)

State the recording requirements for the commissioning of solar thermal hot water system installations

(EVTS4, Kn f)

(n) Clarify the pre-handover checks that need to be carried out

Clarify industry handover procedures in relation to the:

- ◆ provision of written information
- ◆ provision of diagrammatic information
- ◆ provision of verbal information/demonstration relating to system operation and use

(EVTS4, Kn g)

# Workplace Assessed Unit Specification

## Statement of standards (cont)

**UNIT NUMBER:** F8XK 04

**UNIT TITLE:** Install, Test, Commission and Handover Solar Thermal Hot Water Systems

### EVIDENCE REQUIREMENTS

Written and/or oral evidence is required to demonstrate knowledge defined in the PCs and must be produced in controlled supervised, open-book conditions. This may be done by a balance of multiple choice, short answer, restricted response and structured questions.

### OUTCOME 2

Install, test, commission and handover solar thermal hot water systems

### PERFORMANCE CRITERIA

- (a) Plan and prepare for the installation of 'active' solar thermal hot water system
- (b) Install key solar thermal hot water system components
- (c) Test and commission an 'active' solar thermal hot water system
- (d) Handover an 'active' solar thermal hot water system

### RANGE STATEMENT

- (a) Undertake pre-installation checks for a solar hot water system installation to include checks relating to:
  - ◆ authorisation for the work to proceed
  - ◆ verification that the generation capacity of the proposed solar hot water system installation is appropriate to the hot water system load
  - ◆ the availability of appropriate access to all required work areas
  - ◆ the inspection of existing hot water/heating system installations
  - ◆ the availability of a suitable electrical input service
  - ◆ the proposed siting of key internal system components
  - ◆ the suitability of the building structure in relation to the proposed installation
  - ◆ the suitability of the proposed location and position of the solar collector panel(s) for optimum collection capacity
  - ◆ the suitability of the building fabric in relation to the installation of the solar collector panel(s)

(EVTS 1, Perf. 1, 6, 9)

Confirm that the tools, materials and equipment required for the installation work are available and are in a safe usable condition.

(EVTS 1, Perf. 2)

## Workplace Assessed Unit Specification

### Statement of standards (cont)

**UNIT NUMBER:** F8XK 04

**UNIT TITLE:** Install, Test, Commission and Handover Solar Thermal Hot Water Systems

- (b) Install in accordance with manufacturer's guidance, regulatory requirements and industry recognised procedures, key system components on either a fully-filled or drainback 'active' solar thermal hot water system to include as a minimum the positioning, fixing and connection of the following components:

Fully-filled systems:

- ◆ Solar collector
- ◆ Expansion vessel
- ◆ Solar Circulating pump

Drainback systems:

- ◆ Solar collector
- ◆ Drainback vessel
- ◆ Solar Circulating pump

(EVTS 2, Perf. 6,7,8,9,10)

- (c) Prepare a fully-filled or drainback solar thermal hot water system for testing and commissioning to include checks/actions to confirm:

- ◆ compliance with the system design and specification
- ◆ compliance with system/component manufacturer requirements
- ◆ the suitability of electrical supply circuit arrangements
- ◆ correct flushing the system of installation debris
- ◆ correct filling and venting the hydraulic circuits
- ◆ protection of the system against freezing
- ◆ adequate provision of system labeling

(EVTS 2, Perf. 12, EVTS 3, Perf. 1,2, 4)

Test the system for hydraulic soundness using appropriate test equipment in accordance with manufacturer's guidance, regulatory requirements and industry recognised procedures

(EVTS 3, Perf. 3)

## Workplace Assessed Unit Specification

### Statement of standards (cont)

**UNIT NUMBER:** F8XK 04

**UNIT TITLE:** Install, Test, Commission and Handover Solar Thermal Hot Water Systems

Identify the commissioning requirements for the installation in relation to:

- ◆ the system/component manufacturer(s) requirements
- ◆ system design/specification requirements
- ◆ the client/end user requirements
- ◆ statutory regulations and/or industry recognised procedures

(EVTS 3, Perf. 4, EVTS 4, Perf. 1)

Commission a fully-filled or drainback system in accordance with manufacturer's guidance, design, client's and statutory requirements and/or industry recognised procedures

(EVTS 4, Perf. 3, 4)

Complete relevant documentation to record the commissioning activities

(EVTS 4, Perf. 5)

- (d) Undertake relevant checks to ensure that the system is ready for handover and compliant with manufacturer's guidance, the system design/specification, client's, regulatory and/or industry recognised requirements

(EVTS 4, Perf. 5)

Explain and demonstrate to the end user the operation and use of the system using manufacturer's guidance and industry agreed handover procedures

(EVTS 4, Perf. 5)

Identify and explain to the end user any aspects of the system that varies from the agreed specifications and requirements

(EVTS 4, Perf. 5)

Obtain acceptance by the end user of the system according to the industry agreed handover procedures

(EVTS 4, Perf. 5)

Ensure that all relevant handover documentation is correctly completed and recorded in the appropriate information systems and passed to the end user in accordance with manufacturer's guidance and industry recognised procedures

(EVTS 4, Perf. 5)

# Workplace Assessed Unit Specification

## Statement of standards (cont)

**UNIT NUMBER:** F8XK 04

**UNIT TITLE:** Install, Test, Commission and Handover Solar Thermal Hot Water Systems

### EVIDENCE REQUIREMENTS

A practical assessment is required to demonstrate the candidate's ability to Install, test, commission and handover Solar Thermal Hot Water Systems. The Unit covers systems for domestic hot water production only. The Unit focuses upon systems with up to 20m<sup>2</sup> of solar collector area.

### ASSESSMENT

In order to achieve this Unit, candidates are required to present sufficient evidence that they have met all the Performance Criteria for each Outcome within the range specified. Details of these requirements are given for each Outcome. The assessment instruments used should follow the general guidance offered by the SQA assessment model and an integrative approach to assessment is encouraged. (See references at the end of support notes).

Accurate records should be made of the assessment instruments used showing how evidence is generated for each Outcome and giving marking schemes and/or checklists, etc. Records of candidates' achievements should be kept. These records will be available for external verification.

# Workplace Assessed Unit Specification

## Support notes

**UNIT NUMBER:** F8XK 04

**UNIT TITLE:** Install, Test, Commission and Handover Solar Thermal Hot Water 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 60 hours.

### LINKS TO NATIONAL OCCUPATIONAL STANDARDS

Throughout the Unit and where appropriate we have identified where the evidence relates to the SummitSkills National Occupation Standards (NOS) for Environmental Technology Systems for example:

EVTS 1 Kn b relates to the NOS	
EVTS 1	Plan for Environmental Technology Systems, Equipment and Components
Kn b	Knowledge Criteria b
EVTS, Perf 1	
EVTS 2	Plan for Environmental Technology Systems, Equipment and Components
Perf 1	Performance Criteria 2

### APPROACHES TO GENERATING EVIDENCE

Written and/or oral evidence is required to demonstrate knowledge defined in the PCs and must be produced in controlled supervised, open-book conditions.

Assessment of performance shall be carried out using either:

- ◆ evidence sourced from the workplace; and/or
- ◆ through simulation

Use of simulation for the assessment of performance Outcomes

As agreed with sector stakeholders, within the building services engineering sector footprint, simulation is only normally to be used as an assessment method for performance Outcome assessment in:

- ◆ those extremely rare circumstances where candidate/learner is unable to access the required range of work circumstances and as a result the candidate/learner lacks evidence for completion of the Unit(s); or
- ◆ those circumstances where safety critical and/or technical critical aspects of performance need to be assessed.



# Workplace Assessed Unit Specification

## Support notes (cont)

**UNIT NUMBER:** F8XK 04

**UNIT TITLE:** Install, Test, Commission and Handover Solar Thermal Hot Water Systems

SQA and Summitskills recognise that due to the evolving nature of environmental technologies and their integration into the sector, environmental technology system installation, service and maintenance work may not yet be a regular work activity for some sector businesses and as a result restricted or no access to the required range of work circumstances may be more commonplace than for the more established work activities within the sector footprint. In recognition of this SQA and Summitskills considers it appropriate for additional flexibility regarding the use of simulation to be available whilst environmental technology system installation, service and maintenance work becomes more established and commonplace within the sector. However, this flexibility is given on the basis that it will be withdrawn or reduced at an appropriate stage. In order to allow for an initial period of stability in the assessment of environmental technology units the first review of this flexibility will take place in December 2011.

The use of simulation in the assessment of performance Outcomes for environmental technology units is either permissible OR mandatory. Simulation is permitted for all units and all assessed Outcomes until December 2011. This permission is subject to compliance with the requirement for realistic working environment to be used for the simulated activity.

Simulation must take place for key safety critical/technical critical aspects of the environmental technology units. The building services engineering industries cannot afford for the candidates to make mistakes within the workplace and so it is required that candidates, as appropriate, will demonstrate competence of those key safety critical activities and their technical competence in simulated conditions, and under direct assessor observation, as outlined by technology below.

<b>Technology</b>	<b>Mandatory simulation requirements</b>
Solar Thermal	Commissioning of completed new installations All fault identification and rectification activities
Solar Photovoltaic	Installation of solar photovoltaic d.c. circuits and components Inspection and testing of the completed installation including both a.c and d.c circuits All fault identification and rectification activities
Heat Pumps	Commissioning of completed new installations All fault identification and rectification activities
Biomass	To be agreed at upon completion of the Units
Bio-liquids	To be agreed at upon completion of the Units
Water recycling	To be agreed at upon completion of the Units
Micro-wind	To be agreed at upon completion of the Units
Micro-hydro	To be agreed at upon completion of the Units

# Workplace Assessed Unit Specification

## Support notes (cont)

**UNIT NUMBER:** F8XK 04

**UNIT TITLE:** Install, Test, Commission and Handover Solar Thermal Hot Water Systems

### APPROACHES TO ASSESSMENT

In this Unit an appropriate instrument of assessment for Outcome 1 could be a question paper consisting of a balance of multiple choice, short answer, restricted response and structured questions.

Assessment of underpinning knowledge shall be carried out under controlled supervised, open-book conditions using:

- ◆ centre set, centre marked assessment instruments

SQA will ensure that robust quality assurance arrangements are in place for the assessment of underpinning knowledge.

Realistic working environments for simulated practical activities

SQA are required to ensure that approved centres have appropriately realistic working environments for simulated assessment activities. SQA does not wish to be fully prescriptive regarding the requirements of such facilities as this may restrict the ability of some delivering centres to meet SQA approval requirements. However, the following requirements must be met:

- ◆ installation, testing, commissioning, service and maintenance and fault rectification activities shall be assessed using full size systems that replicate installations in a real working environment;
- ◆ the use of mobile rigs and scaled models of system installations shall not be used for the assessment of installation, testing, commissioning, service and maintenance and fault rectification activities.

### 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](http://www.sqa.org.uk/assessmentarrangements)

### REFERENCES

- 1 For a fuller discussion on assessment issues, please refer to SQA's Guides to Assessment and Quality Assurance.
- 2 Procedures for special needs statements are set out in SQA's guide 'Guidance on Special Assessment Arrangements'. (AA0645/3).
- 3 For details of other SQA publications, please consult SQA's publications list. (FD037).