Scottish Qualifications Authority

Workplace Assessed Unit Specification

General information

Unit Number F8XN 04 **Publication date:** June 2010

Title Inspect, Service and Maintain 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 inspect, service and maintain fully-filled and drainback 'active' solar thermal hot water systems. The Unit covers systems for domestic hot water production only. The Unit focuses upon systems with up to $20m^2$ of solar collector area.

OUTCOMES

1 Describe and identify the requirements to inspect, service and maintain 'active' solar thermal hot water systems
2 Inspect, service and maintain 'active' solar thermal hot water systems

ACCESS STATEMENT:

Candidates must be qualified in an appropriate Mechanical Engineering Services or Building Services Engineering to discipline SVQ level 3 or equivalent and must have achieved the units F8XJ 04 Working Principles, Installation Options and Regulatory Requirements for Micro-Renewable Technologies, Water Harvesting and Recycling Technologies and F8XK 04 Install, Test, Commission and Handover Solar Thermal Hot Water Systems.

Workplace Assessed Unit Specification

Statement of standards

UNIT NUMBER: F8XN 04

UNIT TITLE: Inspect, Service and Maintain 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

Describe and identify the requirements to inspect, service and maintain 'active' solar thermal hot water systems.

PERFORMANCE CRITERIA

(a) Describe the requirements for the routine service and maintenance of 'active' solar thermal hot water systems
(b) Describe how to diagnose faults in 'active' solar thermal hot water system installations
(c) Identify how to rectify 'active' solar thermal hot water systems

RANGE STATEMENT

(a) Clarify which documentation needs to be available to enable routine service and maintenance work on 'active' solar thermal hot water systems

(EVTS 5, Kn c)

Clarify typical routine service and maintenance requirements for fully filled systems in relation to:

- visual inspection requirements
- cleaning of components
- checking of system water content
- functional tests

(EVTS 5, Kn b,d)

Clarify typical routine service and maintenance requirements for drainback systems in relation to:

- visual inspection requirements
- cleaning of components
- checking of system water content
- functional tests

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Statement of standards (cont)

UNIT NUMBER: F8XN 04

UNIT TITLE: Inspect, Service and Maintain Solar Thermal Hot Water Systems

(EVTS 5, Kn b,d)

Explain the industry requirements for the recording and reporting of routine service and maintenance work on solar thermal hot water systems

(EVTS 5, Kn e)

(b) Clarify the information that needs to be available to enable fault diagnosis

(EVTS 6, Kn a)

Clarify the work action and sequences required to diagnose the following faults:

- loss of system pressure without evidence of discharge
- discharge from pressure relief valve on the solar primary circuit
- insulation melting on solar collector circuit pipework
- overheating of solar collector circuit
- lack of circulation within the solar collector circuit
- poor or no system performance
- system noise and/or vibration

(EVTS 6, Kn e)

(c) Clarify the work action and sequences required to rectify the following faults:

- loss of system pressure without evidence of discharge
- discharge from pressure relief valve on the solar primary circuit
- insulation melting on solar collector circuit pipework
- overheating of solar collector circuit
- lack of circulation within the solar collector circuit
- poor or no system performance
- system noise and/or vibration

(EVTS 7, Kn b,d)

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.

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Statement of standards (cont)

UNIT NUMBER: F8XN 04

UNIT TITLE: Inspect, Service and Maintain Solar Thermal Hot Water Systems

OUTCOME 2

Inspect, service and maintain 'active' solar thermal hot water systems

PERFORMANCE CRITERIA

(a) Undertake the routine service and maintenance of an 'active' solar thermal hot water system
(b) Undertake fault diagnosis work on 'active' solar thermal hot water system installations
(c) Undertake fault rectification work on 'active' solar thermal hot water system installations

RANGE STATEMENT

(a) Obtain the relevant information required to enable the work

(No specific NOS reference)

Undertake a visual service and maintenance inspection of a fully-filled or drainback 'active' solar thermal hot water system installation to include checks in relation to:

- compliance with manufacturer's installation instructions
- compliance with statutory regulations
- condition of system components including cleanliness
- correct positioning of system components
- security of fixing of system components

(EVTS 5, Perf 3, 4, 5)

Undertake routine servicing of relevant components on a fully-filled or drainback 'active' solar thermal hot water system to include:

- checking the system water levels
- checking provision for the expansion of system water
- checking for protection of the system water against freezing
- cleaning of system components
- adjustment of system controls

(EVTS 8, Perf 1, 2)

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Statement of standards (cont)

UNIT NUMBER: F8XN 04

UNIT TITLE: Inspect, Service and Maintain Solar Thermal Hot Water Systems

Undertake routine service and maintenance functional tests on a fully-filled or drainback solar thermal hot water system to confirm:

- safe operation
- efficient operation
- the correct functioning of system components/controls

(EVTS 8, Perf 1, 2)

Complete the relevant service and maintenance records in accordance with industry recognised procedures

(EVTS 5, Perf 6, EVTS 8, Perf 3)

(b) Obtain the relevant information required to enable the fault diagnosis work

(EVTS 6, Perf 1)

Diagnose the cause of a minimum of FOUR separate faults from the following list:

- Loss of system pressure without evidence of discharge
- Discharge from pressure relief valve on the solar primary circuit
- Insulation melting on solar collector circuit pipework
- Overheating of solar collector circuit
- Lack of circulation within the solar collector circuit
- Poor or no system performance
- System noise and/or vibration

(EVTS 6, Perf 3)

Agree with the relevant person(s) fault rectification procedures for the faults identified

(EVTS 6, Perf 4)

(c) Obtain the relevant information required to enable the fault rectification work

(EVTS 6, Perf 1)

Take relevant precautionary actions to prevent unauthorised use of the system prior to or during the fault rectification work

(EVTS 7, Perf 3)

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Statement of standards (cont)

UNIT NUMBER: F8XN 04

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Take relevant precautionary actions to minimize the risk of injury to self or others during the fault rectification work

(EVTS 7, Perf 3)

Rectify a minimum of TWO separate faults from the following list:

- Loss of system pressure without evidence of discharge
- Discharge from pressure relief valve on the solar primary circuit
- Insulation melting on solar collector circuit pipework
- Overheating of solar collector circuit
- Lack of circulation within the solar collector circuit
- Poor or no system performance
- System noise and/or vibration

(EVTS 7, Perf 1)

Undertake post-rectification functional tests in accordance with manufacturer's guidance, regulatory requirements and industry recognised procedures to confirm that the system is in a safe, functional and efficient condition.

(EVTS 7, Perf 2)

EVIDENCE REQUIREMENTS

A practical assessment is required to demonstrate the candidate's ability to inspect service and maintain Solar Thermal Hot water Systems. The Unit covers systems for domestic hot water production only with up to $20m^2$ 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.

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Support notes

UNIT NUMBER: F8XN 04

UNIT TITLE: Inspect, Service and Maintain 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 40 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.

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Support notes

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UNIT TITLE: Inspect, Service and Maintain 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 forenvironmental 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.

Technology	Mandatory simulation requirements
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

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Support notes

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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**

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).