

## REGULATED QUALIFICATION FRAMEWORK (RQF)

### QUALIFICATION SPECIFICATION

- **LCL Level 3 Awards in the Installation & Maintenance of Solar Thermal Hot Water Systems -**

#### 1. Objective:

The qualification allows learners to continue to learn, develop and practise the skills required for employment within the Renewable sector. Learners will be able to demonstrate they are competent in accordance with legislation, regulations and industry standards to;

1. Know the requirements to install, commission and handover solar thermal hot water systems
2. Install, commission and handover solar thermal hot water systems
3. Know the requirements to inspect, service and maintain solar thermal hot water systems
4. Inspect, service and maintain solar thermal hot water systems

The target groups for the qualification are those learners who are;

1. Updating occupational competence, continuous professional development and or obtaining a licence to practice
2. Preparing for further learning or training and/or developing knowledge and or skills in a subject area who are existing workers in the occupation seeking to extend their range of work}

#### 2. Qualification Framework:

**The qualification comprises of {6 mandatory Units};**

Unit Title	Unit Reference Number	Type of Unit	Level	Credit Rating
<a href="#">Know the requirements to install, commission and handover solar thermal hot water systems.</a> F/602/3100	LCL-R3030	Knowledge	3	1
<a href="#">Install, commission and handover solar thermal hot water systems.</a> L/602/3102	LCL-R3032	Performance	3	1
<a href="#">Know the requirements to inspect, service and maintain solar thermal hot water systems.</a> Y/602/3104	LCL-R3033	Knowledge	3	1
<a href="#">Inspect, service and maintain solar thermal hot water systems.</a> M/602/3107	LCL-R3031	Performance	3	1

**Qualification Structure:**

- **LCL Level 3 Awards in the Installation & Maintenance of Solar Thermal Hot Water Systems**
  - **QAN – 600/7439/5**
  - **QW - C00/0527/3**
  - The Guided Learning Hours (GLH) are **28 hours**
  - The Total Qualification Time (TQT) is **35 hours**
  - The total credit required to achieve the qualification is **4**

**Condition of certification:**

None

**3. Unit Grading Structure:**

**The learner is required to successfully achieve a pass in each unit for this qualification to be awarded.**

#### 4. Unit specification:

**LCL-R3030: Know the requirements to install, commission and handover solar thermal hot water systems.**  
**Assessment Method {MC, SR, OP}**

**Learning Outcome 01: The learner will know the health and safety risks and safe systems of work associated with solar thermal hot water systems installation work.**

The learner can:

- 1.01 Confirm 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 transfer fluid
  - a fall from height
  - personal injury through component/equipment handling.
- 1.02 Confirm 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 transfer fluid
  - a fall from height
  - personal injury through component/equipment handling.

**Learning Outcome 02: The learner will know the requirements of the relevant regulations/ standards relating to practical installation, testing and commissioning activities for solar thermal hot water system installation work.**

The learner can:

- 2.01 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.
- 2.02 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.

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**Learning Outcome 03: The learner will know the types and layouts of solar thermal hot water system.**

The learner can:

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- 3.01 Identify the following solar thermal hot water systems types:
- Fully filled (active)
  - Drain-back (active)
  - Passive (thermosiphon).
- 3.02 Identify the following solar thermal hot water system storage vessel types and collector circuit arrangements:
- direct (fully filled) DHW storage cylinder only
  - indirect, sealed collector circuit, DHW storage cylinder only (solar primary coil only)
  - indirect, sealed collector circuit, DHW storage cylinder only (dual coil)
  - indirect, sealed collector circuit, pre-heat cylinder and DHW storage cylinder
  - indirect, sealed collector circuit, thermal store.

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**Learning Outcome 04: The learner will know the purpose of components used with solar thermal hot water system installations.**

The learner can:

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- 4.01 Confirm 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.

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**Learning Outcome 05: The learner will know the types and key operating principles of solar collectors.**

The learner can:

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- 5.01 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.
- 5.02 Confirm the key operating principles for:
- flat plate collectors
  - evacuated tube collector – direct flow
  - evacuated tube collector – heat pipe.
- 5.03 Identify 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.

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**Learning Outcome 06: The learner will know the information requirements to enable system component selection and sizing.**

The learner can:

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- 6.01 Confirm 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.
- 6.02 Confirm the information requirements in relation to:
- building occupancy
  - required hot water usage pattern.

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**Learning Outcome 07: The learner will know the fundamental techniques used to select, size and position components for solar thermal hot water systems.**

The learner can:

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- 7.01 Confirm 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).
- 7.02 Confirm 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.
- 7.03 Confirm how to determine the annual irradiation yield as a % of optimum in relation to:
- collector orientation
  - collector angle
  - collector over shading.
- 7.04 State typical recommended solar primary circuit circulation rates.
- 7.05 Confirm how to determine solar primary circuit pipe size requirements in relation to:
- primary circuit circulation rates
  - collector area
  - primary circuit pipe work length.
- 7.06 Confirm how to determine total solar primary circuit water content volume.

- 7.07 Confirm how to determine total solar primary circuit expansion vessel size requirements in relation to:
- primary circuit water content volume
  - collector height above cylinder.
- 7.08 Identify typical sizing requirements for drain-back vessels in relation to:
- net collector area
  - total volume of the system.
- 7.09 Confirm how to determine solar primary circuit dynamic pressure drop and circulating pump size requirements for:
- fully filled systems
  - drain back systems.

**Learning Outcome 08: The learner will know how the performance of solar hot water systems is measured.**

The learner can:

- 8.01 Define the meaning of the term 'solar fraction'.
- 8.02 Identify factors that affect the solar fraction.

**Learning Outcome 09: The learner will know the preparatory work required for solar thermal hot water system installation work.**

The learner can:

- 3.01 State the requirements in relation to:
- authorisation for the work to proceed
  - the availability of appropriate access to all required work areas.
- 3.02 Confirm 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 sighting of key internal system components.

**Learning Outcome 10: The learner will know the requirements for connecting solar thermal hot water system collector circuits to combination boiler domestic hot water circuits.**

The learner can:

- 10.01 Confirm how to determine the suitability of combination boilers to receive pre-heated water.
- 10.02 Confirm the pipe work layout and components required for connecting a solar thermal hot water system to a combination boiler to include the:
- 10.03 arrangements for prevention of backflow

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

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**Learning Outcome 11: The learner will know the requirements for installing solar collector arrays.**

The learner can:

- 11.01 Confirm 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).
- 11.02 Confirm the pipe work 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
  - drain back system, single collector array.
- 11.03 Confirm the requirements to achieve durable weather-tightness of buildings where collector array connection pipe work passes through the building fabric.
- 11.04 State when specialist equipment is required in relation to preventing irradiation reaching collector absorbers during installation.

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**Learning Outcome 12: The learner will know the requirements for installing for solar thermal hot water system pipe work.**

The learner can:

- 12.01 Propose suitable pipe work materials in relation to:
- system operating temperatures
  - system operating pressures
  - system chemicals.
- 12.02 Confirm the requirements for pipe work supports in relation to:
- suitable materials
  - spacing of pipe work supports.
- 12.03 State suitable pipe work jointing methods in relation to:
- system operating temperatures
  - system operating pressures
  - system chemicals.
- 12.04 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
  - resistance to vermin attack.
- 12.05 Confirm the requirements for installing pressure relief valve discharge pipe work in relation to:
- routing of pipe work
  - termination of pipe work.

**Learning Outcome 13: The learner will know the requirements to test and commission solar thermal hot water system installations.**

The learner can:

- 13.01 Confirm 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 labelling.
- 13.02 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.
- 13.03 Confirm the testing requirements for hydraulic circuits within solar thermal hot water system installations in relation to:
- hydraulic test pressure
  - hydraulic test duration.
- 13.04 Confirm 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.
- 13.05 Confirm the commissioning requirements for a fully-filled drain-back installation in relation to:
- setting of the system fluid level
  - setting of mechanical controls
  - setting of electrical controls and
  - temperature sensors
  - system functional tests.
- 13.06 Confirm the commissioning requirements for multiple collector arrays connected in series.
- 13.07 State the recording requirements for the commissioning of solar thermal hot water system installations.



**Learning Outcome 14: The learner will know the requirements to handover solar thermal hot water systems.**

The learner can:

- 14.01 Confirm the pre-handover checks that need to be carried out.
- 14.02 Confirm 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.

**LCL-R3032: Install, Commission and Handover Active' Solar Thermal Hot Water Systems**

**Performance Assessments:**

*Where this assessment is conducted in full or in part, either in the work place or a simulated Realistic Work Environment (RWE), the performance assessment must be carried out using installations that will enable the learner to demonstrate competence to install, inspect, test, commission and handover to the end user a new solar thermal hot water system and associated components covered by this assessment and that the assessment will enable the Unit's performance and knowledge assessment criteria to be met.*

**Workplace Performance Assessments:**

*Workplace performance assessments must be undertaken with the learner being directly supervised by a competent person.*

*It is the responsibility of the assessor to ensure that;*

- *The assessment being undertaken by the learner is carried out in accordance with the requirements of prevailing legislation and normative standards at the time of assessment.*
- *A risk assessment has been carried out by the learner and that the assessment has taken into account and mitigated potential or actual risks either before or during the assessment.*
- *The supervising engineer holds valid certificates of competence in the areas of work being undertaken by the learner.*
- *Confirmation has been given by the responsible person of the property for the work to be carried out.*

**Realistic Work Environment (RWE) Assessments:**

*The assessment must be undertaken on an installed fixed system. The assessment facility/equipment must simulate a realistic and working active solar thermal hot water system installation.*

*The assessment task must be undertaken using fit-for-purpose tools and equipment and include realistic completion deadlines and other commercial requirements.*

**Practical Assessment Provisions and Conditions**

**Learning Outcome (LO) 01** *the assessment area must simulate a real working environment, i.e. an environment in which real work activities take place under real working conditions in keeping with real commercial situations. The assessment task must be undertaken using fit-for-purpose tools and equipment, full-size components and include realistic deadlines and other commercial requirements. The roof area need not be at height. However, the design of the assessment area and the assessment task must require the learner to work on the roof and use safe systems of work. The learner must not be able to complete the entire task from the ground.*

**LO 02** For the purpose of simulated assessment only, the Assessment Criteria can be reduced to install the solar collector only. The assessment must require the learner to:

- Position and fix the collector to a pitched tiled or slated roof slope.
- Connect the collector to the primary circuit pipe work in the roof space.
- Weather the pipe work penetration.

**LO 03** For the purpose of simulated assessment only, providing the system installation that will be used by the learner for the assessment of AC 3.4 has been satisfactorily pressure tested by the centre before the commencement of the assessment of AC 3.4, it is not necessary for the learner to undertake assessment relating to this AC.

This flexibility is given on the basis that the learner will have demonstrated the knowledge of the hydraulic test requirements as part of the assessment of unit (F/602/3100) LCL-R3030 and will have been assessed as being competent to undertake hydraulic tests as part of the pre-requisite entry requirements for the qualifications in which this unit features.

Whilst desirable, it is not essential that the solar collector be subjected to real or artificial solar energy during the commissioning activity. In the event that solar collector is not subjected to real or artificial solar energy during the commissioning activity, the assessor must identify methods of enabling the commissioning checks to be completed. For example, the temporary removal of an artificial heating and/or cooling of temperature sensors may enable the operation of the Differential Temperature Controller and the circulating pump to be checked. Please note: The use of halogen lamps is not considered to be an effective method of creating artificial solar energy.

**LO 04** Assessment must be based upon the learner collating all required handover documentation and explaining and demonstrating the operation and use of the system to the end user.

**The handover documentation provided must align with the requirements of the Microgeneration Certification Scheme (MCS) Microgeneration Installation Standard: MIS 3001.**

**Learning Outcome 01: The learner will plan and prepare for the installation of 'active' solar thermal hot water system.**

The learner can:

- 1.01 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 domestic 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)
- 1.02 For optimum collection capacity
  - The suitability of the building fabric in relation to the installation of the solar collector panel(s).

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

Note; only those Assessment Criteria in **blue text** are required to be assessed as part of a simulated assessment carried out in a RWE i.e. an Assessment Centre.

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**Learning Outcome 02: The learner will install solar thermal hot water system components.**

The learner can:

- 2.01 Install in accordance with manufacturer's guidance, regulatory requirements and industry recognised procedures, key system components on either a fully-filled or drain-back, '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
  - Drain-back systems
    - solar collector
    - drain-back vessel
    - solar circulating pump.

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**Learning Outcome 03: The learner will inspect and test 'active' solar thermal hot water system components.**

The learner can:

- 3.01 Prepare a fully-filled or drain-back 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 labelling
- 3.02 *\*Test the system for hydraulic soundness using appropriate test equipment in accordance with manufacturer's guidance, regulatory requirements and industry recognised procedures.*

Note; *\* AC 3.2 See Practical Assessment Provisions and Conditions*

- 3.03 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.

- 3.04 Commission a fully-filled or drain-back system in accordance with manufacturer's guidance, design requirements, client's requirements and statutory requirements and/or industry recognised procedures.
- 3.05 Complete relevant documentation to record the commissioning activities.

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**Learning Outcome 04: The learner will inspect and test 'active' solar thermal hot water system components.**

The learner can:

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- 4.01 Undertake relevant checks to ensure that the system is ready for handover and compliant with manufacturer's guidance, the system design/specification, client's requirements, regulatory requirements and/or industry recognised requirements.
- 4.02 Explain and demonstrate to the end user the operation and use of the system using manufacturer's guidance and industry agreed handover procedures.
- 4.03 Identify and explain to the end user any aspects of the system that varies from the agreed specifications and requirements.
- 4.04 Obtain acceptance by the end user of the system according to the industry agreed handover procedures.
- 4.05 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.

**LCL-R3033: Know the Requirements to Inspect, Service And Maintain 'Active' Solar Thermal Hot Water Systems**

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**Learning Outcome 01: The learner will inspect and test 'active' solar thermal hot water system components.**

The learner can:

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- 1.01 Confirm which documentation needs to be available to enable routine service and maintenance work on 'active' solar thermal hot water systems.
- 1.02 Confirm the 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.
- 1.03 Confirm the typical routine service and maintenance requirements for drain back systems in relation to:
  - visual inspection requirements
  - cleaning of components
  - checking of system water content
  - functional tests.
- 1.04 Confirm the industry requirements for the recording and reporting of routine service and maintenance work on solar thermal hot water systems.

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**Learning Outcome 02: The learner will know how to diagnose faults in 'active' solar thermal hot water system installations.**

The learner can:

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- 2.01 Confirm the information that needs to be available to enable fault diagnosis.
- 2.02 Confirm 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.

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**Learning Outcome 03: The learner will know how to rectify faults in 'active' solar thermal hot water systems.**

The learner can:

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- 3.01 Confirm 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.

**LCL-R3031: Inspect, service and maintain solar thermal hot water systems.**

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**Performance Assessments:**

*Where this assessment is conducted in full or in part, either in the work place or a simulated Realistic Work Environment (RWE), the performance assessment must be carried out using installations that will enable the learner to demonstrate competence to install, inspect, test, commission and handover to the end user a new solar thermal hot water system and associated components covered by this assessment and that the assessment will enable the Unit's performance and knowledge assessment criteria to be met.*

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**Workplace Performance Assessments:**

*Workplace performance assessments must be undertaken with the learner being directly supervised by a competent person.*

*It is the responsibility of the assessor to ensure that;*

- *The assessment being undertaken by the learner is carried out in accordance with the requirements of prevailing legislation and normative standards at the time of assessment.*
  - *A risk assessment has been carried out by the learner and that the assessment has taken into account and mitigated potential or actual risks either before or during the assessment.*
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- *The supervising engineer holds valid certificates of competence in the areas of work being undertaken by the learner.*
- *Confirmation has been given by the responsible person of the property for the work to be carried out.*

**Practical Assessment Provisions and Conditions:**

*The assessment may be undertaken using either an installed fixed system or a portable assessment rig. Regardless of whether an installed fixed system or a portable assessment rig is used, the assessment facility/equipment must simulate a realistic and working fully-filled or drain-back solar hot water system installation.*

*The assessment task must be undertaken using fit-for-purpose tools and equipment and include realistic completion deadlines and other commercial requirements.*

*Whilst desirable, it is not essential that the solar collector is subjected to real or artificial solar energy during post-rectification testing activity. In the event that the solar collector is not subjected to real or artificial solar energy during the post-rectification testing activity, the assessor must identify methods of enabling the post-rectification testing checks to be completed.*

**Please note:** *The use of halogen lamps is not considered to be an effective method of creating artificial solar energy.*

**Assessment evidence:**

*The assessment of performance skills must be assessed by observation and oral questioning, where required, by an approved Assessor in either a RWE or in the workplace.*

**Learning Outcome 01: The learner will undertake the routine service and maintenance of an 'active' solar thermal hot water system.**

The learner can:

- 1.01 Obtain the relevant information required to enable the work to be undertaken.
- 1.02 Undertake a visual service and maintenance inspection of a fully-filled or drain back, '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.
- 1.03 Undertake routine servicing of relevant components on a fully-filled or drain back, '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.
- 1.04 Undertake routine service and maintenance functional tests on a fully-filled or drain back solar thermal hot water system to confirm:
  - safe operation
  - efficient operation
  - the correct functioning of system components/controls.
- 1.05 Complete the relevant service and maintenance records in accordance with industry recognised procedures.

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**Learning Outcome 02: The learner will undertake fault diagnosis work on 'active' solar thermal hot water system installations.**

The learner can:

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- 2.01 Obtain the relevant information required to enable the fault diagnosis work.
- 2.02 Identify 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.
- 2.03 Agree with the relevant person(s) fault rectification procedures for the faults identified.

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**Learning Outcome 03: The learner will undertake fault rectification work on 'active' solar thermal hot water system installations.**

The learner can:

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- 3.01 Obtain the relevant information required to enable the fault rectification work.
- 3.02 Take relevant precautionary actions to prevent unauthorised use of the system prior to or during the fault rectification work.
- 3.03 Take relevant precautionary actions to minimise the risk of injury to self or others during the fault rectification work.
- 3.04 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.
- 3.05 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.

## 5. National Occupational Standard:

The Units used in this qualification have a direct relationship with the National Occupational Standards for the areas of work contained within.

## 6. RQF Descriptor Level 3.

### **Knowledge descriptor:** *(the learner can)*

- *Has factual, procedural and theoretical knowledge and understanding of a subject or field of work to complete tasks and address problems that while well-defined, may be complex and non-routine.*
- *Can interpret and evaluate relevant information and ideas.*
- *Is aware of the nature of the area of study or work.*
- *Is aware of different perspectives or approaches within the area of study or work.*

### **Skills Descriptor** *(the learner can)*

- *Identify, select and use appropriate cognitive and practical skills, methods and procedures to address problems that while well defined, may be complex and non-routine.*
- *Use appropriate investigation to inform actions.*
- *Review how effective methods and actions have been.*

## 7. Prior qualifications, knowledge, skill or understanding which the learner is required to have before taking this qualification. (Pre-requisites)

- N/SVQ Level 2/3 in Plumbing or equivalent earlier certification that provides evidence of competence;
- or
- N/SVQ Level 2/3 in Heating and Ventilating (Domestic Installation) or equivalent earlier certification that provides evidence of competence.
- or
- N/SVQ Level 2/3 in Heating and Ventilating (Industrial and Commercial Installation) or equivalent earlier certification that provides evidence of competence.
- or
- N/SVQ Level 2/3 in Oil-Fired Technical Services or equivalent earlier certification that provides evidence of competence;
- or
- N/SVQ Level 2/3 in Gas Installation and Maintenance or equivalent earlier certification that provides evidence of competence.

In addition, if not included in the above current certification in relation to:

- Water Regulations/Water Byelaws
- Unvented Domestic Hot Water Storage Systems
- Energy Efficiency for Domestic Heating

Note: vocationally related qualifications (technical certificates) are not acceptable as an alternative to the N/SVQ awards listed above.



**8. Units which a learner must have completed before the qualification will be awarded and any optional routes.**

None

**9. Other requirements which a learner must have satisfied before the learner will be assessed or before the qualification will be awarded.**

None

**10. The design and delivery of the examination associated with these units are based on the following documents;**

Manufacturer's Installation and Commissioning Instructions  
Microgeneration Certification Scheme (MCS) Microgeneration Installation Standard: MIS 3001

**11. The criteria against which learners' level of attainment will be measured.**

The Learning Outcomes and Assessment Criteria against which learners' level of attainment will be measured are detailed in Section 4 of this specification.

**12. Planned exemptions**

None

**13. Specimen assessment materials.**

None

**14. Specified levels of attainment**

Learners must pass all the mandatory units for the qualification to be awarded.

Learners must achieve;

- A mark of 75% per question or more to pass the short response written examinations for the qualification to be awarded.
- A mark of 100% to pass the multiple choice examinations for the qualification to be awarded.
- Satisfy all performance assessment criteria for the qualification to be awarded.

**15. Other information**

None

## **Assessment and Examination Terminology**

**AC** – *Approved Centre; an examination conducted either at the approved centre or a location approved by the centre, using staff approved by the centre to conduct the examination.*

**CBSR** – **Closed Book** *Short Response; Short response written questions will be set by the awarding organisation and administered and marked locally at the approved centre by approved markers. Learners will be prohibited from using industry normative or informative documents.*

**CE** – *Customer Evidence; evidence provided by a customer in the form of a written witness statement confirming a competent performance by the learner. That evidence may also be provided by an employing supervisor or manager of the learner. Witness statements that relate to a technical competence will only be accepted from a person technically competent in that particular activity to provide the statement.*

**IK** – *Inferred Knowledge; inferred knowledge is assessed as part of a performance assessment by a centre approved assessor. To deem the learner as having sufficient knowledge the learner must satisfactorily pass the performance assessment.*

**LE** – *Learner Evidence; learner generated evidence is for example documented recordings of readings, calculations or the production of a risk assessment or other procedural document.*

**MC** – *Multiple Choice; set by the awarding organisation and administered and marked locally or electronically. Learners will be able to answer multi-choice questions using reference to appropriate industry normative or informative sources.*

**O/L** – *Online: a secure web-based assessment system (XAMS)*

**OP** – *Observed Performance; the assessment of a learner's performance by an approved assessor either in the learner's work place or at the approved centre or a location approved by the centre.*

**OQ** – *Oral Questions; oral questions may be asked by an assessor as part of a performance assessment or knowledge examination to confirm the understanding of the criteria by the learner.*

**PA** – *Performance Assessment; a performance assessment conducted either in the learner's work place or at the approved centre or a location approved by the centre.*

**RWE** – *Realistic Work Environment; an area at the approved centre or a location approved by the centre which replicates and has the features of a Work Place. The learner must not be permitted to be familiar with the simulated environment prior to undertaking assessment.*

**SR** – *Short Response question*

**WP** – *Work Place; is the naturally occurring environment in which the learner works, typically that would be in a customer's premise where work is being paid for by the customer.*

SSAs: 5.2 Construction

Review Date 31/12/2021