The Certification Mark for Onsite
Sustainable Energy Technologies

Microgeneration Installation Standard: MIS 3001

REQUIREMENTS FOR MCS CONTRACTORS UNDERTAKING THE SUPPLY, DESIGN, INSTALLATION, SET TO WORK, COMMISSIONING AND HANDOVER OF SOLAR HEATING MICROGENERATION SYSTEMS

Issue 4.2

This Standard has been approved by the Steering Group of the Microgeneration Certification Scheme (MCS).

This Standard was prepared by the MCS Working Group 1 'Solar Heating Systems'.

REVISION OF MICROGENERATION INSTALLATION STANDARDS

Microgeneration Installation Standards will be revised by issue of revised editions or amendments. Details will be posted on the website at www.microgenerationcertification.org.

Technical or other changes which affect the requirements for the approval or certification of the product or service will result in a new issue. Minor or administrative changes (e.g. corrections of spelling and typographical errors, changes to address and copyright details, the addition of notes for clarification etc.) may be made as amendments.

The issue number will be given in decimal format with the integer part giving the issue number and the fractional part giving the number of amendments (e.g. Issue 3.2 indicates that the document is at Issue 3 with 2 amendments).

Users of this Standard should ensure that they possess the latest issue and all amendments.

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FOREWORD

The following document contains provisions, which, through reference in this text, constitute normative or informative provisions of this document MIS 3001. At the time of publication, the editions indicated were valid. All documents are subject to revision, and parties applying this document MIS 3001 are encouraged to investigate the possibility of applying the most recent editions of the documents referenced.

The following document MIS 3001 issue 4.2 is a minor update to MIS 3001 issue 4.1. It is available for reference from the date of publication (01/05/2015). MCS Contractors of microgeneration systems who are certificated in accordance with MIS 3001 may commence working in accordance with this update from the date of publication (01/05/2015). MCS Contractors of microgeneration systems who are certificated in accordance with MIS 3001 shall commence working in accordance with this update from the date of implementation (01/08/2015).

This Standard identifies the evaluation and assessment practices to be undertaken by the Certification Bodies for MCS for the purposes of approval and listing of MCS Contractors undertaking the supply, design, installation, set to work, commissioning and handover of Solar Heating Systems. The listing and approval is based on evidence acceptable to the Certification Body:

- that the Solar Heating System or service meets the Standard;
- that the MCS Contractor has staff, processes and systems in place to ensure that the Solar Heating System or service delivered meets the Standard;

And on;

- periodic audits of the MCS Contractor including testing as appropriate;
- compliance with the contract for the MCS listing and approval including agreement to rectify faults as appropriate.

This Standard shall be used in conjunction with the MCS 001 scheme document and any other guidance and / or supplementary material available on the MCS website specifically referring to this Microgeneration Certification Standard (MIS 3001). A

catalogue of guidance and supplementary material to be read in conjunction with MIS 3001 can be found on the MCS website, www.microgenerationcertification.org.

Government defines microgeneration as the production of heat and/or electricity on a small-scale from a low carbon source. The various technologies have the potential to help achieve the objectives of tackling climate change, ensuring reliable energy and tackling fuel poverty.

The objective of government's Microgeneration Strategy is to create conditions under which microgeneration becomes a realistic alternative or supplementary energy generation source for the householder, for the community, and for small businesses.

Notes:

This Microgeneration Installation Standard makes use of the terms 'must', 'shall' and 'should' when prescribing certain requirements and procedures. In the context of this document:

- *the term 'must' identifies a requirement by law at the time of publication;*
- *the term 'shall' prescribes a requirement or procedure that is intended to be complied with in full and without deviation;*
- *the term 'should' prescribes a requirement or procedure that is intended to be complied with unless reasonable justification can be given.*

Compliance with this Microgeneration Installation Standard does not of itself confer immunity from legal obligations.

Users of Microgeneration Installation Standards should ensure that they possess the latest issue and all amendments.

The Steering Group welcomes comments of a technical or editorial nature and these should be addressed to "The Secretary" at mcs@gemserv.com.

Listed products and services may be viewed on the website: www.microgenerationcertification.org.

1 SCOPE

1.1 This Standard specifies the requirements of the MCS for MCS Contractors undertaking the supply, design, installation, set to work, commissioning and handover of Solar Heating Systems to supply domestic hot water, space heating and swimming pools for permanent buildings.

1.2 Multiple MCS certified solar collectors may be used in a single installation, but the individual output for a single appliance shall not exceed 45 kWth as defined by the MCS product certification scheme document MCS 004.

1.3 The scope of this MCS Installation Standard is limited to installations with a design heat load requirement of up to 70 kWth.

2 DEFINITIONS

Commissioning	The advancement of an installation from the state of setting to work of an installation, the regulation of the system and the fine tuning of the static completion to full working order to the specified requirements. Commissioning includes recording all relevant measurements, flow rates and / or test results, and includes the preparation and submission of a commissioning report or certificate as required by the relevant technology standard that shall confirm that the system is capable of delivering the performance quoted to the customer.
Contract	An undertaking for the design, supply, installation, set to work, commissioning and handover of systems covered by the relevant technology standard. All contracts must be written to be compliant with MCS requirements.
Design	The formulation of a written plan including a specific list of products

	and fixings to form a completed system for a defined microgeneration technology; including extensions and alterations to existing Microgeneration systems.
Handover	The point in a contract where commissioning and certification of the system have been satisfactorily completed to the contract specification so enabling the installation to be formally explained and handed over to the client. Including all relevant documentation required by the relevant technology standard.
Installation	The activities associated with placement and fixing of a microgeneration system.
MCS Contractor	An individual, body corporate or body incorporate, applying for or holding MCS certification for delivery of supply, design and / or design review, installation, set to work, commissioning services and handover for systems covered by the relevant technology standard.
Set to work	The activities necessary to make the installed equipment function as a completed system prior to commissioning.
Solar Heating System	System composed of Solar Thermal Collectors and other components for the delivery of thermal energy.
Solar Thermal Collector	Device designed to absorb solar radiation and to transfer the thermal energy so produced to a fluid passing through it without a change in state. *Note: A fluid may be a liquid, air or other gas.*
Subcontract	A written contract between an MCS contractor and another firm for the supply of products and services in connection with the fulfilment of a contract.

3 REQUIREMENTS FOR THE MCS CONTRACTOR

3.1 Capability

3.1.1 MCS Contractors shall have the capability and capacity to undertake the supply, design, installation, set to work, commissioning and handover of solar heating microgeneration systems.

3.1.2 Where MCS Contractors do not engage in the design or supply of Solar Heating Systems, but work solely as an MCS Contractor for a client who has already commissioned a system design; then the MCS Contractor shall be competent to review and verify that the design would meet the design requirements set out in this Standard and this should be recorded.

3.2 Quality Management System (QMS)

3.2.1 MCS Contractors shall operate a satisfactory Quality Management System which meets the additional requirements set out in the scheme document MCS 001.

3.3 Subcontracting

3.3.1 In installations for private customers, any work within the scope of the scheme not undertaken by employees of the MCS Contractor shall be managed through a formal subcontract agreement between the two parties in accordance with the policies and procedures employed by the MCS Contractor. These procedures shall ensure that the subcontractor undertakes the work in accordance with the requirements of this standard.

3.3.2 In other situations (for example new build or for commercial customers), it is permissible for the physical installation, setting to work and commissioning to be undertaken by others (i.e. not subcontracted to the MCS Contractor) provided that:

3.3.3 A contract between the MCS Contractor and the commercial client details obligations on the client to include that evidence of skills and training of those employed

by the client to do elements of work not undertaken by the MCS Contractor. This is to be made available to the MCS Contractor to ensure that the competence requirements of this Standard are met and that access to the site for training and supervision in accordance with the following sections is agreed in advance.

3.3.4 The MCS Contractor provides additional product-specific training for those undertaking the work not undertaken by the MCS Contractor.

3.3.5 The MCS Contractor assesses a sample number of installations under the Contract which is not less than the square root of the number of installations rounded up to the nearest whole number (e.g. for a new build site of 50 installations, a minimum of 8 are assessed).

3.3.6 The MCS Contractor assumes responsibility at handover that the installation is in full compliance with the Standard.

3.4 Consumer Code of Practice

3.4.1 The MCS Contractor shall be a member of and, when dealing with domestic consumers, comply with a Code of Practice (Consumer Code), which is relevant to the scope of their business in the microgeneration sector and which is approved by the Trading Standards Institute (or formally approved under the Office of Fair Trading (OFT) prior to April 1st 2013).

4 DESIGN AND INSTALLATION REQUIREMENTS

4.1 Regulations

4.1.1 All applicable regulations and directives must be met in full. It should be noted that regulations that must be applied may be different in England, Northern Ireland, Scotland and Wales. MCS Contractors shall ensure they have a system to identify all applicable regulations and changes to them.

4.1.2 All work, and working practices, must be in compliance with all relevant Health and Safety regulations and risk assessments shall be conducted before any work on site is commenced.

4.1.3 All MCS Contractors shall make their customers aware of all permissions and approvals required for the installation.

4.1.4 The MCS Contractor shall assess the building using a competent professional experienced in solar thermal systems to ensure that the site is suitable for the installation and that the building will meet the requirements of the Building Regulations (in particular those relating to energy efficiency) and other regulations applicable to their work during and following installation.

4.1.5 Where required, planning permission shall be obtained before work is commenced.

4.1.6 Where work is undertaken that is notifiable under the Building Regulations it shall be made clear to the customer who shall be responsible for this notification.

4.1.7 The MCS Contractor shall ensure that this notification has been completed prior to handing over the installation. Self-certification, in lieu of building control approval, is only permitted where installation and commissioning is undertaken by a person deemed competent and registered with a Competent Persons Scheme (CPS) approved by the Department for Communities and Local Government (DCLG) for the scope of work being undertaken. Further details can be found at http://www.competentperson.co.uk.

4.2 Manufacturer's Instructions

4.2.1 Solar heating systems shall be installed such that all manufacturers' instructions are followed. Where manufacturer's instructions conflict with the requirement of this Standard, the MCS contractor shall conform to this standard unless it can be proven that conformance to the manufacturer's instructions will facilitate a system that is more efficient and no less safe or durable than if the requirements of this Standard had been met.

4.3 Design and Installation

4.3.1 The requirements outlined in MIS 3001 shall be met when designing, specifying and installing a Solar Heating System.

4.4 Safety and Durability

Solar Heating Systems shall:

4.4.1 Incorporate safety devices to ensure that the temperature of the stored water does not exceed 100^{o}C at any time and comply with national regulations.

4.4.2 Safeguard against pressures exceeding the pressure rating of the weakest component.

4.4.3 Incorporate a means to limit the temperature of the water at all points of use after an assessment of scald risk factors.

NOTE:For domestic applications this requirement might be met through the provision of thermostatic mixing valves (TMVs) within 2,000mm of all points of use set at no more than 46^{o}C (or lower dependent upon the point of use in question) OR the provision of TMVs at the outlets from the hot water cylinder set at 55^{o}C – 60^{o}C OR the provision of a thermostatic device to limit the solar input to the hot water cylinder OR a combination of the above.

4.4.4 Incorporate a means to control bacterial growth (including Legionella bacteria) in domestic hot water.

Notes:

(a) A solar cylinder providing a direct feed of pre-heated water to a combination boiler is unlikely to meet this requirement without further bacterial control measures such as a daily heat pasteurisation of the entire cylinder. A solar cylinder (primary store) providing indirect feed (internal or external heat exchanger) to a combination boiler represents a lower risk and may not require further bacterial control measures subject to the bacterial risk assessment.
(b) A Solar Heating System comprising a twin coil cylinder is likely to meet this requirement subject to the boiler-heated zone being heated daily to 60^{o}C for 1 hour and its volume exceeding the predicted daily hot water demand of the building.
(c) Further guidance can be found within the Health and Safety Executive Approved Code of Practice L8 document (HSE ACoP L8).

4.4.5 Ensure that future performance and safety are not significantly affected by mineral deposits forming in the solar primary circuit.

Note: This requirement is met by indirect Solar Heating Systems where fresh water is not continually being introduced to the solar primary circuit.

4.4.6 Incorporate means to protect the Solar Heating System from damage due to freezing.

4.4.7 Not expose components, including pipe work, joints, insulation, expansion vessels and pipe supports to temperatures outside their designed temperature range.

Note: Many standard heating components may not be suitable for the temperatures and pressures present in solar primary circuits.

4.4.8 Be designed such that there is auto-resume of normal operation after stagnation without user intervention (often referred to as “intrinsically secure”).

Note: Stagnation can be defined as a state whereby flow within the primary solar circuit stops whilst the Solar Thermal Collector is still exposed to solar radiation. Stagnation can occur through purposeful temperature control of the water in the hot water cylinder or through a system fault (e.g. pump or electrical failure). On sealed systems, this requirement would be met through the provision of sufficient capacity in an expansion vessel to accommodate the volume of any vapour created within the Solar Thermal

Collector and connected pipe work along with the provision of a valve left in the closed position before any automatic air vent.

4.4.9 Ensure the supply of pre-heated water to the cold inlet of an instantaneous water heating appliance is at a temperature no higher than the maximum cold inlet temperature for the appliance as specified by the manufacturer.

Note: Special consideration should be given to requirements 4.4.3 and 4.4.4 in this situation.

4.4.10 Be designed and installed to allow for safe de-commissioning.

Note: This requirement is UNLIKELY to be met without the provision of sufficient, suitably located, drain points to allow draining of all parts of the Solar Heating System (primary and secondary circuits).

4.4.11 Protect against burns and unnecessary heat loss by the insulation of all pipes, with the exception of branch pipes to expansion vessels.

Note: This includes all of the pipes, joints and components in the solar primary circuit from the Solar Thermal Collector to the cylinder via the pump station. It also includes all other pipes connected to the hot water cylinder (boiler primary and hot water draw off), as far as is reasonably practicable, but in any event it must include at least the first one metre of any pipe from the hot water cylinder.

***For the solar primary circuit**, the following table of minimum insulation thickness is deemed to satisfy both this requirement and Part L of the Building Regulations in England and Wales.*

Table 1. Minimum required wall thickness for High Temperature EPDM based rubber insulation products.

Minimum required wall thickness for High Temperature EPDM based rubber insulation products used for solar primary circuits assuming a mean flow temperature of 50ºC and a conductivity of 0.038 W/mK						
	Pipe Outside Diameter					
	10mm	12mm	15mm	22mm	28mm	35mm

Minimum insulation wall thickness	9mm	13mm	13mm	19mm	25mm	32mm

Where other insulation materials are used the thicknesses shall be adjusted such that the heat loss is no higher than the heat loss for the insulation in the table.

4.5 Solar Heating System performance

Solar Heating Systems shall:

4.5.1 Be designed and installed to prevent the export of non solar generated heat to the solar collectors.

Note: Export from anything other than a dedicated solar volume would not comply with this requirement.

4.5.2 Be designed and installed such that any auxiliary heating system has a control interlock wherever possible.

Note: An interlock is where the controls are wired so that when there is no demand for heat for either space heating or hot water the auxiliary heating appliance and associated circulator (pump) are switched off. This requirement would NOT be met where a boiler capable of being fully interlocked is left supplying heat to the hot water cylinder through gravity circulation.

4.5.3 Solar installations using mains electricity for pump and / or control shall be designed so that:

- Combined pump and controller power is equal to or less than 50W or 2% of solar peak power, whichever is the larger; and
- Where solar peak power is defined as 700W per m^2 of aperture area of collector.

4.5.4 Be designed and installed to comply with relevant local and national building legislation and associated guidance such as Approved Documents L and the Domestic Building Services Compliance Guide in England and Wales, or equivalent in other relevant jurisdictions. Irrespective of any references to dedicated solar volume in such legislation or guidance, Solar Heating Systems with dedicated solar volume below that

required by Approved Documents L and the Domestic Building Services Compliance Guide in England and Wales, are permitted provided that:

a) Other than having a lower dedicated solar volume, the Solar Heating System complies with all relevant recommendations within such relevant legislation or guidance.
b) Solar Heating System performance is optimised by controlling the timing of backup (auxiliary / non-solar) sources of water heating, for example by:
    i. During daytime, avoiding backup heating and minimising daytime "boost" to short periods only. Also, during the evening after the sun can no longer significantly contribute heat, timing daily backup heating to heat the water to 60^{o}C and hold it there for one hour, and ideally to switch it off before all baths or showers are taken. This way the amount of cool water in the cylinder available for solar heating the next day is maximised, and solar energy performance is increased;
    ii. A full explanation being given to the customer of all relevant controls including an explanation that any changes could reduce the effectiveness of the Solar Heating System;
    iii. Affixing a durable label at all relevant solar, and backup, system time-control points to communicate the importance to Solar Heating System performance of the timing of backup heating.
c) Where the Solar Heating System is connected to an existing cylinder then:
    i. The thermal insulation of the hot water cylinder, and all pipes connected to it, shall be upgraded to a level at least equivalent to that applicable to new installations under relevant legislation and guidance. For cylinders with factory applied insulation, this condition can be satisfied if the cylinder standing heat loss is certified to comply with Section 12 of BS1566-1: 2002 or equivalent. Where this certification is not apparent, or where the cylinder does not have factory-applied insulation, the MCS Contractor shall install additional insulation certified to comply with BS5615: 1985;

ii. Backup heating system controls shall be upgraded in accordance with 4.4.3;
iii. Proper duty of care shall be exercised to ensure that the hot water cylinder is fit for purpose as regards its mechanical integrity. Consideration shall be given to scale build-up affecting overall (solar and backup) system efficiency, damage, and deterioration caused by corrosion. Such issues shall be considered in the context of any additional stress placed upon the cylinder through the connection of the Solar Heating System (e.g. thermal stress or additional system pressure);
iv. Where indirectly connected via a heat exchanger that this heat exchanger shall have a surface area of at least 10% of the surface area of the Solar Thermal Collector's aperture area.

Note: Alternative justifications of Solar Heating System performance shall be considered by the Certification Body. The Certification Body may, at its discretion, charge a fee for such consideration.

4.5.5 Be accompanied by an estimate of annual energy performance calculated as follows;

For domestic installations providing only domestic hot water:
Calculate the annual solar energy input to the cylinder in accordance with MCS 024 Solar Domestic Hot Water Energy Calculation.

The energy estimate shall be communicated with the client at or before the Contract is awarded and shall be accompanied by the following disclaimer:

> *"The performance of solar heating systems is impossible to predict with certainty due to the variability in the amount of solar radiation (sunlight) from location to location and from year to year together with variability in heat demand. This estimate is based upon the standard MCS procedure and is given as guidance only. It should not be considered as a guarantee of performance."*

For Solar Heating Systems which provide a solar dedicated volume that meets the solar dedicated volume requirements of the Domestic Building Services Compliance Guide add:

> *"The performance of solar heating systems can be influenced by the actions of the user, especially by timing back-up heating to finish before hot water use. The customer could achieve an energy benefit higher than the estimate by following operating instructions."*

For Solar Heating Systems which provide a solar dedicated volume that does not meet the solar dedicated volume requirements of the Domestic Building Services Compliance Guide add:

> *"The performance of solar heating systems can be influenced by the actions of the user, especially by timing back-up heating to finish before hot water use. The customer could achieve energy savings higher than the estimate by carefully following operating instructions. The type of solar heating system in this quotation is sensitive to user behaviour and the customer should be aware that failure to follow operating instructions could diminish the solar energy performance."*

For Solar Heating Systems outside the scope of MCS 024, an approved means of estimating energy performance shall be provided under the provisions of the SAP methodology Appendix Q (special features and specific data).

Additional estimates may be provided using an alternative methodology but any such estimates must clearly describe and justify the method employed and the factors used. These additional estimates must not be given greater prominence than the estimation method specified in this standard and shall not be used on the MCS certificate. In addition, it must be accompanied by warning stating that it should be treated with caution if it is significantly greater than the result given by the standard method.

<u>For non-domestic installations and Solar Heating Systems outside the scope of SAP and MCS 024:</u>

Calculate the annual solar energy input to the system using proprietary software. The software package, version number and all simulation inputs and outputs should be fully

communicated to the client at or before the point that the contract is awarded. All input assumptions must be stated and must be appropriate to the installation.

4.6 Site specific issues

The following issues shall be addressed in the design of Solar Heating Systems for each installation:

4.6.1 The roof structure shall be checked to ensure it can withstand the imposed loads as calculated (see Note below). If there is any doubt, a structural engineer must be consulted.

Note: Where a new roof incorporates new trussed rafters, the designer of those trussed rafters shall be advised of the position, number and weight of the solar collectors to be mounted onto the roof structure. Reference in this standard to a structural engineer means an individual or organisation holding relevant professional indemnity insurance and is a member of a relevant professional body such as the Institution of Structural Engineers.

4.6.2 The Solar Thermal Collector and its fixings (type and quantity) shall be of sufficient strength to withstand the imposed (dead load) and wind uplift loads. For each site the imposed wind and snow loads shall be derived using the procedures within Eurocode 1 (BS EN1991-1) multiplied by a Load Safety Factor (SF_L) of 1.35.

The pressure coefficients (Cp) used to calculate wind loads shall be derived as follows:

- For Solar Thermal Collectors that are mounted above, and parallel to, an inclined roof where there is a clear gap between the array and the roof - the pressure coefficients shall be taken from BRE Digest 489 or from recognised test data commissioned for the specific purpose of determining the wind loads on solar systems.
- For flat roof systems - the pressure coefficients shall be taken from BRE Digest 489 or from recognised test data commissioned for the specific purpose of determining the wind loads on solar systems.
- For roof integrated, nominally airtight systems - the pressure coefficients shall be taken from Eurocode-1.

NOTE:

(a) In order to satisfy this requirement the maximum design resistance of the specified solar collector and fixings cannot be less than the calculated imposed loads (plus Load Safety Factor, SF_L).

(b) The MCS Contractor shall ensure that the construction (e.g. timber dimensions) to which the solar installation is fixed equals or exceeds the minimum specification declared by the manufacturer of the fixings.

(c) The MCS Guide to the Installation of Photovoltaic Systems provides a simplified method to derive wind loads in accordance with 4.6.2 (see Annex B).

(d) The design resistance of a solar panel kit or component is the maximum test resistance divided by a Material Safety Factor (SF_M) as shown in the table below:

Failure Mode at Maximum Test Resistance	***Material Safety Factor (SF_M)***
Serviceability limit state (e.g. excessive displacement or breakage of roof covering materials)	*1.0*
Failure in a metal component	*1.1*
Pull-out from a metal component	*1.25*
Failure in a timber component, or pull out from a timber component (e.g. roof structure)	*1.44*
Failure mode unknown or not declared	*1.44*

(e) Solar panel kits tested to MCS 012 will either declare a design resistance to ultimate loads, which can be used without adjustment, or a characteristic resistance that must be divided by the appropriate Material Safety Factor, SF_M;

(f) A solar thermal collector tested to BS EN 12975-1 that does not declare a test resistance has a test resistance equal to the minimum requirement of the standard, 1,000 Pa. Where no failure mode is declared this corresponds to a

design resistance of 694 Pa (i.e. 1000/1.44). A solar thermal collector tested to BS EN ISO9806 that does not declare a test resistance has a test resistance equal to the minimum requirement of the standard, 2,400 Pa. Where no failure mode is declared this corresponds to a design resistance of 1666 Pa (i.e. 2400/1.44).;

(g) For installations assembled from separate components not tested together as a kit, the roof fixing components shall be tested to MCS012 and the declared design resistance of each component and Solar Thermal Collector must independently exceed the calculated imposed load (plus Load Safety Factor, SF_L); and,

(h) For the avoidance of doubt, adding more fixing brackets to the number used in testing of the solar thermal collector does not increase the resistance of the collector beyond its tested value.

4.6.3 Where a Solar Thermal Collector is integrated in roof forming the primary roof covering, the location of the collector shall be in accordance with local regulations in respect of external spread of flame accounting for the declared fire class of the combined collector and roof integration kit.

Note: To demonstrate compliance with building regulations in England and Wales, Scotland and Northern Ireland, a fire resistance classification to BS476-3 or BS EN 13501-5 (Test 4) is required. Products tested to MCS 012 will show the fire classification on the test report.

4.6.4 Solar Thermal Systems shall not adversely affect the weather tightness of the structure to which they are fitted. The system should be designed and installed to ensure this is maintained for the life of the system.

4.6.5 For roof integrated systems, the weather tightness of the system shall be tested and certified to be the same or better than the roof or cladding systems they are replacing and to not adversely affect the weather tightness of the surrounding covering.

Note: an acceptable means of demonstrating compliance with this requirement is to use a roof integration system suitable for the class of roof covering and roof pitch and tested to MCS 012.

4.6.6 For above roof systems, the fixings shall not affect the weather tightness of the roof they are fitted to. For example, systems attached to pitched tile roofs should be designed and installed such that the fixing brackets do not displace the tiles and cause gaps more than naturally occurs between the tiles. Fixing methods shall not subject roof coverings to imposed loads that may degrade their primary purpose of maintaining weather-tightness.

Tiles or slates removed for fixing a mounting bracket should be re-attached to include a means of mechanical fixing.

Notes:

a) *An acceptable means of demonstrating compliance with this requirement is to use roof-fixing brackets tested to MCS 012 and suitable for the class of roof covering and roof pitch.*

b) *Historically, some mounting systems on slate or tile roofs have relied on a simple "through bolt" approach. However, this fixing method has the potential for the fixing bolts or sealing washer cracking the slates/tiles beneath them. It can also present difficulties with ensuring the long term weather tightness and durability of the roof penetration.*

   Therefore through tile or slate penetrations (for bolts and pipes) shall only be used where the following requirements are met:

   - *The bolt, pipe or flashing shall not transfer any load on the slates / tiles beneath;*
   - *The system shall not rely on silicone or other mastic sealant to provide a weather-tight seal;*
   - *The system must durably seal every layer of roof covering that is perforated by the pipe or bolt system;*

- *The system shall not rely on a sealing washer or plate that presses down on the slate/tile to ensure a weather tight seal;*
- *Bolt fixings shall not be into battens.*

4.6.7 The roof underlay should be inspected for damage during installation works. Any damage should be repaired or the underlay replaced as necessary. Damaged underlay will not provide an effective weather and air barrier, and can affect weather tightness and the wind loads imposed on the roof cladding.

4.6.8 Where the system is intended to be eligible for domestic RHI payments or where metering/monitoring equipment is to be fitted to an existing installation, the MCS Contractor shall:

- Make the client aware of any metering that is required in order for the system to comply with requirements in the MCS Domestic RHI Metering Guidance and ensure this is detailed in the quotation before the contract is awarded; and
- Ensure the system conforms to the MCS Domestic RHI Metering Guidance in full.

4.7 Commissioning

4.7.1 The Solar Heating System shall be commissioned according to a documented procedure to ensure that the system is safe, has been installed in accordance with the requirements of this Standard and the manufacturer's requirements, and is operating correctly in accordance with the system design.

Note: Guidance on appropriate Solar Heating System checks is given in the Appendix B Section B3.

4.7.2 A label shall be fixed immediately adjacent to the systems primary controller as described in Appendix D.

4.8 Equipment

4.8.1 When making installations in accordance with this Standard the Solar Thermal Collectors used in installations shall be listed by one of the following schemes:

- MCS (http://www.microgenerationcertification.org)

- The CEN Keymark for Solar Thermal Products (http://www.estif.org/solarkeymarknew/index.php)

5 ROLES AND COMPETENCY REQUIREMENTS

5.1 All personnel employed by, or subcontracted to, the MCS Contractor must be able to demonstrate that they are competent in the disciplines and skills, appropriate to the activities required for their role, in accordance with this Standard.

5.2 Complete records of training (where appropriate) and competence skills of personnel must be maintained by the MCS Contractor, in particular:

- Design staff, carrying out full conceptual design, must be able to demonstrate a thorough knowledge of the technologies involved and the interaction of associated technologies.
- All personnel engaged in the actual installation are expected to have technical knowledge and installation skills, to install components and equipment within the designed system, in accordance with all appropriate codes of practice, manufacturer's specifications and regulations. As a minimum MCS Contractors should have proven current training / experience with relevant Solar Thermal Systems as shown in Appendix A.
- All personnel engaged in the final inspection, commissioning, maintenance or repair, must have a comprehensive technical knowledge of the products, interfacing services and structures to complete the specified processes.

5.3 Please see Appendix A below which contains the required roles which will need to be fulfilled by the MCS Contractor for this MIS 3001 Standard.

5.4 The Competence Criteria to be demonstrated by the MCS Contractor can be found via the MCS website (www.microgenerationcertification.org). In addition to this, the MCS Contractor guidance on how to achieve compliance and the descriptions of the required roles which will need to be fulfilled can also be found on the MCS website (www.microgenerationcertification.org).

6 HANDOVER REQUIREMENTS

6.1 At the point at which the Solar Heating System is handed over to the client, the documentation as detailed in Appendix B shall be provided and explained to the client.

6.2 The Compliance Certificate shall be completed ensuring that the certificate corresponds to the current version of this standard at the time of commissioning. A copy of the Compliance Certificate shall be provided to the client. The template of the Compliance Certificate can be found on the MCS website at this link.

6.3 The annual energy input as calculated in kWh/year, shall be entered into the MCS Installation Database (MID). The value entered into the MID shall be calculated in accordance with MCS 024 where the system provides domestic hot water only. This can be achieved by using the current version of the MCS Thermal Solar Performance Energy Calculator (TSPEC). Where as system is used for any other purpose i.e. providing swimming pool heating, the annual energy input shall be calculated using an appropriate software tool. A copy of this calculation shall be retained by the MCS Contractor for the minimum period defined within MCS 001 and made available for audit.

6.4 All MCS installations shall be registered to the MCS Licensee through the MCS Installation Database. A certificate shall be obtained from the MCS Installation Database for each installation showing that the installation has been registered with the Scheme and shall be provided to the customer no later than 10 working days after the date of commissioning the system; on provision of the certificate the customer shall be instructed to include it within the handover pack.

6.5 The generation of the certificate shall be undertaken in full compliance with the terms and conditions of use of the MCS Installation Database[1] and the registration of the system on the MCS installation database shall only be undertaken after the system has been fully installed and commissioned.

[1] The terms and conditions of use can be found on the MCS Installation Database website.

6.6 A “per installation” fee is levied on MCS Contractors for each registration added to the database. Details of any such fee will be advised from time to time through MCS Certification Bodies.

7 REGIONAL OFFICES

7.1 Where the MCS Contractor wishes to design and commission under the Scheme in regional offices, then these offices shall meet the requirements of this Standard to be eligible for certification.

8 PUBLICATIONS FOR REFERENCE & FURTHER READING

8.1 The below list is provided so that MCS Contractors know which documents have been used as a basis for the development of the requirements of this MIS standard and they are able to further research topics if they need to do so.

8.2 It is not a scheme requirement for MCS Contractors to own or have immediate access to the documents referenced unless this MIS standard does not adequately cover off the aspects required.

- CE131 – Solar Water Heating Systems, guidance for professionals, conventional indirect models. Available from www.microgenerationcertification.org
- Domestic Building Services Compliance Guide – Available from the Planning Portal: www.planningportal.gov.uk
- BS EN 12975-2:2006 Thermal solar systems and components – Solar collectors – Part 2 Test methods. Available from British Standards Institution (BSI): www.bsigroup.com/en-GB/
- BS EN ISO 9806:2013 Solar Energy – Solar Thermal Collectors – Test Methods. Available from British Standards Institute (BSI): www.bsigroup.com/en-GB
- Eurocode 1 – BSEN 1991, Actions on Structures, Available from British Standards Institution (BSI): www.bsigroup.com/en-GB/
- HSE ACoP L8 Legionnaires’ disease. The control of legionella bacteria in water systems. Approved Code of Practice and guidance (HSE) available from: www.hse.gov.uk.

- Low carbon equipment and building regulations – A guide to safe and sustainable construction. Available from : http://www.scotland.gov.uk/Resource/Doc/217736/0097175.pdf
- MCS 001 – Installer certification scheme document. Available from www.microgenerationcertification.org
- MCS 012 – Product Certification Requirements: Pitched Roof Installation Kits. Available from www.microgenerationcertification.org
- MCS 024: Solar domestic hot water energy calculation. Available from: www.microgenerationcertification.org.
- MCS Domestic RHI Metering Guidance. Available from: www.microgenerationcertification.org.
- MCS PV Guide. Available from: www.microgenerationcertification.org.
- Scottish Water Byelaws 2004. Available from : http://www.scottishwater.co.uk
- The Government's Standard Assessment Procedure for Energy Rating of Dwellings. Available from: https://www.gov.uk/standard-assessment-procedure
- Thermal Solar Performance Energy Calculator (TSPEC). Available from: www.microgenerationcertification.org.
- Water Supply (Fittings) Regulations 1999 (England and Wales) and Water Supply (Water Fittings) Regulations (Northern Ireland) 2009. Available from: http://www.legislation.gov.uk

APPENDIX A: ROLES AND COMPETENCY REQUIREMENTS

	3001	3002	3003	3004	3005	3007	3007-2	300x
Roles	**ST**	**PV**	**Wind**	**Biomass**	**Heat Pumps**	**CHP (Heat)**	**CHP (Elec)**	**Innovative Technology**
Nominee	✓	✓	✓	✓	✓	✓	✓	**
Nominated Technical Person(s)	✓	✓	✓	✓	✓	✓	✓	**
Health and Safety co-ordinator	✓	✓	✓	✓	✓	✓	✓	**
Designer(s) Full scope	✓	✓	✓	✓	✓	✓	✓	**
Designer(s) Limited scope	✓	✓	✓	✓	✓	✓	✓	**
Electrical competencies	*	✓	✓	*	*	✓	✓	**
Plumbing competencies	✓	×	×	✓	✓	✓	✓	**
Heating competencies	*	×	×	✓	✓	✓	✓	**
Refrigeration competencies	×	×	×	×	*	×	×	**
Specialist competencies	*	*	*	*	*	*	*	**

✓ Required for the technology

× Not required for the technology

* If applicable to the technology

** For further details please see the MCS Change Process and the Competence Criteria on the MCS website: (www.microgenerationcertification.org).

☐ A change of staff fulfilling this role would require notification to the Certification Body.

APPENDIX B: MINIMUM REQUIREMENTS - HANDOVER DOCUMENTATION

At the point at which the Solar Heating System is handed over to the client, the documentation as detailed below shall be provided and explained to the client:

- User Guide (See section B1)
- Technical Documents/file including:
    - Details of the installation (see section B2)

      Note: For installations providing domestic hot water only, a copy of the Thermal Solar Performance Energy Calculator (TSPEC) could be used to fulfil this requirement
    - An ‘as fitted’ system schematic plan of both plumbing and electrical systems - detailing all functioning components of the Solar Heating System up to the point of integration with backup heat source input to storage vessel
    - A completed Commissioning Checklist (see section B3 for minimum content)
    - A Compliance Certificate
    - A certificate obtained from the MCS Installation Database, showing that the installation has been registered with the scheme (to be provided within 10 working days of the commissioning date)

Note: All though there is some duplication between the compliance certificate and the commissioning checklist. The compliance certificate confirms both the design and installation is in accordance to this standard but on the assumption that it may be completed by office/managerial staff it relies on a declaration by the installation technician given in the commissioning checklist.

B1 Information for the User

Handover information provided to the client shall at minimum include the following user information:

- Where the solar and backup heating share the same hot water cylinder: a description of how the timing of back-up heating relative to the times of hot water use should be controlled to achieve maximum energy yield from the Solar Heating System.
- A warning of the risk of bacterial growth within the hot water system and how this should be controlled.
- A note explaining the presence of the temperature controls in the Solar Heating System and their purpose in preventing scald injuries.
- An explanation of any user actions (including frequency) necessary to maintain lime scale protection devices.
- Where the solar heated water is feeding a combination boiler in accordance with 4.3.10: boiler manufacturer's written instructions for this type of duty.
- Information to allow a competent person to undertake the safe de-commissioning of the Solar Heating System including appropriate warnings.
- Details of the methods employed to control damaging effects of freezing, along with the lowest temperature that these methods protect to. The method and frequency of maintaining this protection (where required) should also be stated.
- All manufacturer documents and warranties relating to any installed equipment.
- Any routine maintenance required, such as visual inspection, pump replacement, and antifreeze replacement.

B2 Details of installation

NOTE: The Thermal Solar Performance Energy Calculator (TSPEC) can be used in place of document B2 where the system provides domestic hot water only.

A document detailing:

- Solar Thermal Collector:
  - Manufacturer's name
  - Type and model numbers
  - Total aperture area
  - Zero loss Solar Thermal Collector efficiency (ηo) from BS EN 12975 and/or BS EN ISO 9806 test reports
  - Heat loss coefficient (a1) from BS EN 12975 and/or BS EN ISO 9806 test reports
  - Second order heat loss coefficient (a2) from BS EN 12975 and/or BS EN ISO 9806 test reports
- Hot Water Cylinder:
  - Manufacturer's name
  - Type and model number
  - Total volume (V)
  - Volume of the dedicated solar volume (Vs)
  - Surface area of solar heat exchange coil
  - Where cylinder is replaced, surface area of any backup heat exchange coils
  - Maximum working pressure of each heat exchange coil
- Solar Controller:
  - Manufacturer and model
  - Type
- Energy Calculation Parameters:
  - Where occupancy known:

        - Number of adults in primary residence
        - Number of children in primary residence
        - Number of students in residence only outside term time
        - Other part-time occupants
    - Where occupancy not known:
        - Total Floor Area
    - Panel orientation
    - Panel tilt from horizontal
    - SAP region
    - Overshading factor
    - Hot water use adjustment factor (from SAP Table H3)
    - Has the dwelling been classed as water efficient (not more than 125L per person per day)?
    - Does the dwelling have a Waste Water Heat Recovery System (WWHRS)?

B3 Commissioning Checklist

The minimum contents of a Solar Commissioning Checklist shall include the following:

- Name, address, telephone of the MCS Contractor
- Name of technician undertaking commissioning
- Collector make, model and serial numbers
- Confirmation that Solar Heating System has been checked for leaks
- For closed loop Solar Heating Systems: confirmation that system has been flushed
- Confirmation that the insulation is in accordance with this standard
- Confirmation that the pump has been tested, produces a flow rate in accordance with manufacturer's guidelines, and deactivates under the appropriate circumstances of either the collector temperature being lower than that of the solar volume in the cylinder, or where the cylinder maximum temperature setting has been achieved
- Confirmation that all roof penetrations are as per the design and do not adversely affect the weather tightness of the structure.
- Confirm the prescribed MCS label is fixed adjacent to the solar controller
- A record of glycol/water % (where glycol is used as a frost protection measure)
- A record of system pressure (if pressurised)
- A record of gas side pressure on expansion vessel (if fitted)
- A record of the settings of the solar controller, dT on, dT off and Tmax
- Confirmation that the solar and cylinder sensors (where used) are installed to the correct locations and secured in place
- Type of method used to control scald risk at outlets
- Method to control scald risk at outlets
- Where an unvented cylinder is installed: confirmation that the solar pump is connected through a high limit thermostat
- Where the solar loop has a pressure relief valve: confirmation that the pressure relief has been terminated to a suitable location
- Where an auto air vent is used: confirmation that the auto air vent has been isolated from the solar loop once commissioning is completed

- Where the solar loop is not a drainback: confirmation that the solar loop is fitted with measures to prevent reverse thermo-syphon
- Declaration signed by the installation technician confirming the installation has been installed to the design and manufacturer's instructions.

APPENDIX C: BUILDING REGULATIONS

In England and Wales, the Building Regulations most immediately relevant to Solar Heating Systems include (other parts may also apply):

- Part A – Structure: ensuring the building, solar collector and fixing system can withstand the calculated loads for the site
- Part B – Fire Safety: ensuring the fire performance of the existing roof covering is not adversely affected
- Part C – Resistance to contaminants and moisture: ensuring the weather tightness of the structure is not adversely affected
- Part G - Sanitation, Hot Water Safety and Water Efficiency
- Part L - Conservation of fuel and power
- Part P – Electrical Safety

In England and Wales, all work undertaken where the Building Regulations apply must be notified and notification can take place in several ways, the two principal methods are:

- Submitting a building notice to the relevant Local Authority's Building Control department prior to the work commencing;
- Notifying the work through a Competent Persons Scheme after the work is complete.

In Northern Ireland the Building Regulations most immediately relevant to Solar Heating Systems include (other parts may also apply):

- Part C – Site Preparation
- Part D – Structure
- Part E – Fire Safety
- Part F – Conservation of Fuel and Power

In Scotland, all solar water heating installations serving a building must comply with the requirements of the Building (Scotland) Regulations 2004, as amended, including the

functional standards listed in Regulation 9, Schedule 5. Further guidance is available from : Low carbon equipment and building regulations – A guide to safe and sustainable construction. Available from : http://www.scotland.gov.uk/Resource/Doc/217736/0097175.pdf

APPENDIX D: LABELLING

A label shall be fixed immediately adjacent to the systems primary controller.

This label shall be made from a durable material and so affixed as to ensure that it will remain in place for the expected lifetime of the system.

The label shall be a minimum size of 75mm X 100mm and contain the text as detailed below; it shall have a black border, black font and yellow background. It shall have a minimum font size of 20 for the first line and a minimum font size 9 for the remainder of the text.

Caution Before Altering Settings

This system has been commissioned to run efficiently using carefully considered settings

Alterations to these settings could invalidate the systems certificate of compliance

Any alteration to these settings may have an adverse effect on the efficiency of the system resulting in increased running costs and as such should only be undertaken in full knowledge of the overall system design

AMENDMENTS ISSUED SINCE PUBLICATION

Document Number:	Amendment Details:	Date:
1.2	Amended 3.4 Consumer Code of Practice wording. Updated e-mail and website addresses.	25/02/2008
1.3	Gemserv details added as Licensee. Document reformatted to reflect brand update. References to BERR updated to DECC, MCS logo updated accordingly. Website and email addresses updated to reflect new name.	01/12/2008
1.4	Quality review.	10/01/2009
1.5	MCS Mark updated.	25/02/2009
1.6	Changes to Clause 4.4.3 as agreed at the MCS Steering Group on 27/10/2009.	29/10/2009
1.7	Additional contacting options were added to clause 3.3. As agreed in the MCS Steering on 27/10/2009.	28/01/2010

	References to Clear Skies have been removed from clause 4.8 and a link to the MCS website added.	
2.0	Addition of text under Section 6 – Handover incorporating the generation of MCS Certificates from the MID for each installation. Changes are as agreed at SG meeting of May 27th 2010.	26/08/2010
3.0	Substantive update with re-writes to all sections.	01/10/2013
4.0	Addition of compliance certificate. Appendix D added. Minor amendments to all sections following public consultation period.	16/12/2013
4.1	Amendment to clause 4.4.9 Update to Appendix B	21/11/2014
4.2	Update to definitions. Clause 4.3 modified. Clause 8 guidance on requirements added.	01/05/2015