



The Certification Mark for Onsite
Sustainable Energy Technologies

Microgeneration Installation Standard: MIS 3001

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

Issue 1.7

This standard has been approved by the Steering Group of the 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

This Standard identifies the evaluation and assessment practices to be undertaken by the certification bodies of the MCS for the purposes of approval and listing of 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 system or service meets the standard
- that the contractor has staff, processes and systems in place to ensure that the system or service delivered meets the standard

and on:

- periodic audits of the 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 MCS 001 scheme document.

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 us achieve our 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:-

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.

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1. SCOPE

This Standard specifies the requirements of the MCS for 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.

2. DEFINITIONS

Contractor	An individual, body corporate or body incorporate, applying for or holding certification for the services detailed in the Scope, Clause 1, above.
Contract	A written undertaking for the design, supply, installation, set to work and commissioning of Microgeneration systems and technologies.
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.
Installation	The activities associated with placement and fixing of a Microgeneration system.
Set to work	The activities necessary to make the Microgeneration system function as a completed system.
Commissioning	The activities to ensure that the installed system operates within the boundaries and conditions of the design and the product manufacturers' claims.
Sub-contract	A written contract between a certificated contractor and another firm for supply of products and services in connection with the fulfilment of a contract.
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 handed over to the client.

3. REQUIREMENTS FOR THE CERTIFICATED CONTRACTOR

3.1 Capability

Certificated Contractors shall have the capability and capacity to undertake the supply, design, installation, set to work, commissioning and handover of solar heating microgeneration systems. Where Contractors do not engage in the design or supply of solar heating systems, but work solely as an installer for a client who has already commissioned a system design; then the 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

Contractors shall operate a satisfactory quality management system which meets the additional requirements set out in the scheme document MCS 001.

3.3 Subcontracting

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

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 Contractor) provided that:

3.3.1 A contract between the 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 Contractor are to be made available to the 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.

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

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3.3.3 The certificated 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. a new build site of 50 installations then a minimum of 8 are assessed).

3.3.4 The certificated Contractor assumes responsibility at handover that the installation is in full compliance with the standard.

3.4 Consumer code of practice

The Contractor shall be a member of and, when dealing with domestic consumers, shall 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 Office of Fair Trading (OFT). In the absence of any approved codes the MCS will accept codes that have completed stage 1 of the OFT approval process (e.g. REAL Code).

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4. DESIGN AND INSTALLATION REQUIREMENTS

4.1 Regulations

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 and Wales, Scotland and Northern Ireland. Some guidance on applicable regulations is given in the guidance document MCS 002. This guidance is not necessarily exhaustive and may change from time to time. Certificated Contractors shall ensure they have a system to identify all applicable regulations and changes to them.

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

4.2 Design and installation

The following principles shall be met when designing, specifying and installing a solar heating system. For the principles numbered 4.3.1 to 4.3.13, one means of compliance would be to follow the guidance in Energy Saving Trust publication CE131: Solar water heating systems – guidance for professionals, conventional indirect models.

4.3 Safety and durability

Systems shall:

- 4.3.1 Incorporate appropriate measures to prevent stored water exceeding 100°C (in accordance with the Water Supply (Fittings) Regulations 1999)

Note: this requirement would be met through the use of appropriate vent pipes, temperature control devices and other safety devices. For unvented storage see 4.3.11.

- 4.3.2 Safeguard against pressures exceeding the pressure rating of the weakest component.

Note: for open vented primary solar circuits, this requirement would be met provided there was no possibility of the vent route becoming obstructed. Any means of over pressure control (e.g. pressure relief valve) must be set lower than the maximum pressure rating of the weakest component in the system. The discharge points from protection devices and open vents must be in a safe location to minimise any risk of injury to people or damage to property.

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4.3.3 Incorporate a means to limit the water at all points of use to no more than 60°C or lower depending upon scald risk factors.

Note: this requirement would be met through the provision of thermostatic mixing valves (TMVs) within 2,000mm of all points of use set at no more than 46°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°C – 60°C OR the provision of a thermostatic device to limit the solar input to the hot water cylinder OR a combination of the above.

4.3.4 Incorporate a means to prevent bacterial growth (legionella) at all foreseeable flow rates.

Note: one way of meeting this requirement would be through the use of a secondary means of heating the water to 60°C.

4.3.5 Ensure that future performance and safety are not significantly affected by lime scale forming in the solar primary circuit.

Note: this requirement is met by indirect systems where fresh water is not continually being introduced to the solar primary circuit.

4.3.6 Incorporate appropriate means to protect the solar system from damage due to freezing.

4.3.7 Ensure all components, including pipe work, joints, insulation and pipe supports are not exposed 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.

4.3.8 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 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

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sufficient capacity in an expansion vessel to accommodate the volume of any vapour created within the collector and connected pipe work along with the provision of a valve left in the closed position before any automatic air vent.

4.3.9 Be installed such that all manufacturers' instructions are followed.

4.3.10 Ensure the supply of pre-heated water to the cold inlet of combination boilers does not take place unless written instructions for this type of duty are provided by the boiler manufacturer; those written instructions are followed in full and left on site for the user.

Note: the pre-heating of combination boilers (or any instantaneous water heater) without explicit written instructions from the boiler manufacturer indicating how this should be achieved for the model in question is not permitted.

4.3.11 Incorporate a manual reset limit thermostat on unvented cylinders in order to control the solar primary circuit in such a way that the addition of heat is prevented when the temperature of stored water in the cylinder reaches 85°C.

Note: this manual reset limit thermostat is in addition to any thermostatic control required to comply with 4.2.3. Furthermore, this manual reset limit thermostat does not on its own completely satisfy Building Regulations G3 which must be complied with in full.

4.3.12 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 system (primary and secondary circuits).

4.3.13 Ensure that all pipes are lagged / insulated to protect against burns and unnecessary heat loss.

Note: this includes all of the pipes in the solar primary circuit, except the branch pipe to an expansion vessel. 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. This clause does not require the insulation of components which should not be insulated.

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4.4 System performance

Systems shall:

- 4.4.1 Be designed and installed to prevent the export of energy from the hot water cylinder added by any auxiliary or secondary heat source.

Note: the system must not use heat export as a freeze control strategy.

- 4.4.2 Be designed and installed such that any auxiliary heating system have 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 pump are switched off. This requirement would NOT be met where a boiler capable of being fully interlocked is left relying on gravity to supply heat to the hot water cylinder.

- 4.4.3 Be designed and installed to comply with relevant local and national building legislation and associated guidance such as Approved Documents L and the Domestic Heating Compliance Guide in England & Wales, or equivalent in other relevant jurisdictions. Irrespective of any references to dedicated solar volume in such legislation or guidance, systems with dedicated solar volume below that required by Approved Documents L and the Domestic Heating Compliance Guide in England & Wales, are permitted provided that:

- a) Other than having a lower dedicated solar volume, the system complies with all relevant recommendations within such relevant legislation or guidance;
- b) Any reduction in system performance is minimised by taking reasonable steps to minimise the use of backup (non-solar) sources of domestic hot water heating or, where applicable, by controlling any reduction in solar fraction. These measures include:
 - i. the adjustment of the time settings of backup heating controls such that timed backup energy input only takes place between 1600 and 2200hrs. Consideration should be given to the use of a later on-time (than 1600hrs) for westerly facing systems;

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- 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 system;
 - iii. including within the handover documents a clear explanation of the use of the solar heating system. Such information shall prominently communicate the affect on solar system performance of the timing of backup energy sources;
 - iv. affixing a durable label at all relevant solar, and backup, system time-control points to communicate the importance to solar system performance of the timing of backup heating.
- c) Where the solar thermal 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 installer shall install additional insulation certified to comply with BS5615: 1985;
 - ii. backup heating system controls shall be upgraded in accordance with 4.4.2;
 - 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 thermal 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 collector's aperture area.

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

4.4.4 Be accompanied by an estimate of annual energy performance calculated as follows:

For domestic installations, using Appendix H of the Standard Assessment Procedure for Energy rating (SAP) methodology (www.bre.co.uk/sap2005). This 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. This estimate is based upon the Government's standard assessment procedure for energy rating of buildings (SAP) and is given as guidance only. It should not be considered as a guarantee of performance."

Additional estimates may be provided using an alternative methodology but any such estimates must clearly describe and justify the approach taken and factors used and must not be given greater prominence than the standard SAP estimate. 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.

For non-domestic installations, a performance calculation using proprietary software is permitted. This information should be communicated with the client at or before the point that the contract is awarded.

4.5 Site specific issues

The following issues shall be addressed in the design of solar heating systems for each installation:

4.5.1 All Contractors shall make their customers aware of all permissions and approvals required for the installation. The Contractor shall assess the building using a qualified professional experienced in solar heating systems to ensure that the site is suitable for the installation and that the building will meet the

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requirements of the building regulations and other applicable regulations applicable to their work during and following installation. Where required, planning and/or building control approval should be obtained before work is commenced.

4.5.2 All roof penetrations (e.g. for the collector, pipe work, cables or bracketry) shall be durably sealed using purpose-made products capable of accommodating the movement and temperatures to which they may be subjected.

Note: in all circumstances the building's weather tightness must be maintained. Holes drilled through roofing felt and/or roof tiles/slates sealed with mastic or silicone sealant are not considered durable. Purpose-made roof tiles and flashings for the routing of pipes from a collector are examples of durable solutions.

4.5.3 External metalwork used for bracketry or mounting frames shall be constructed to correctly support the imposed static and wind loads, must be adequately ballasted or fixed into a suitable structural member and shall be adequately protected from corrosion for a typical life to first maintenance of at least 20 years. (e.g. stainless steel number 1.4301 or 1.4401 to EN 10088¹ or galvanised coating on mild steel as specified in EN ISO 14713:1999 for the appropriate environment, or equivalent).

4.5.4 The Contractor shall ensure that the roof structure is capable of withstanding the loads (static and wind loads) that will be imposed by the solar collectors and their mounting arrangements. 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.

¹ Steel No 1.4301 (ASTM Grade 304) and 1.4401 (ASTM Grade 316) are both suitable for rural, urban and light industrial sites and No 1.4401 (ASTM Grade 316) is also suitable for industrial and coastal sites.

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4.6 Commissioning

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 manufacturers' requirements, and is operating correctly in accordance with the system design.

Note: guidance on appropriate system checks is given in the Energy Saving Trust publication CE131.

4.7 Documentation

Certificated Contractors shall provide customers with a comprehensive document pack which, as a minimum, includes the following:

- details of the actual collector installed to include:
 - the manufacturer's name
 - type and model numbers
 - serial numbers
 - total aperture area
 - zero loss collector efficiency (η_0) from EN 12975 test report
 - collector heat loss coefficient (a_1) from EN 12975 test report
- details of the actual hot water cylinder installed to include:
 - the manufacturer's name
 - model number
 - total volume (V)
 - volume of the dedicated solar volume (V_s)
 - surface area of solar heat exchange coil
 - surface area of any auxiliary heat exchange coils
 - maximum working pressure of each heat exchange coil
- 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 warning of the risk of bacterial growth within the hot water cylinder, how this should be controlled and if in doubt to seek specialist advice.
- a note explaining the presence of the temperature controls in the system and their purpose in preventing scald injuries.
- an explanation of any user actions (including frequency) necessary to maintain lime scale

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protection devices.

- where applicable, manufacturer's instructions for any combination boiler or other instantaneous water heater supplied with pre-heated water from the solar heating system.
- the procedure for the safe decommissioning of the solar heating system including appropriate warnings.
- details of the methods employed to control damaging effects of freezing along with the lowest temperature 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 system commissioning checklists and certificates.
- any routine maintenance required by the user.
- installer contact details and warranty.

4.8 Equipment

When making installations in accordance with this Standard the solar collectors used in installations shall be listed by one of the following schemes:

- the MCS (<http://www.microgenerationcertification.org>) .
- **non-roof-integrated** products with the CEN Keymark for Solar Thermal Products (www.estif.org/solarkeymark/productsandcertificates.php).

Equipment should be suitable for its application and have a manufacturer's declaration of conformity for the appropriate standard.

5. COMPETENCE OF STAFF

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

Complete records of training and competence skills of personnel must be maintained by the certificated 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

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accordance with all appropriate codes of practice, manufacturer's specifications and regulations.

- 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.

Examples of qualifications that may be suitable for satisfying some of the training requirements are given in Appendix A

Note: due to the current development of the Sector Skills Agreement and the review in progress of the National Occupational Standards for this technology, the indicated suggested scope in Appendix A, may change.

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6. HANDOVER REQUIREMENTS

At the point at which the solar heating system is handed over to the client, the documentation as detailed in 4.7 shall be provided and explained along with:

- The maintenance requirements and maintenance services available
- A certificate signed by the Contractor containing at least the following:
 - A statement confirming that the solar thermal system meets the requirements of this standard
 - Client name and address
 - Site address (if different)
 - Contractors name, address etc.
 - List key components installed
 - Estimation of system performance calculated according to 4.4.4

7. REGIONAL OFFICES

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

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8. PUBLICATIONS REFERRED TO

The following list implies the latest edition and amendments:

- CE 131 – Solar Water Heating Systems, guidance for professionals, conventional indirect models. Available from The Energy Saving Trust: www.greenspec.co.uk/documents/energy/EST-solarWaterHeating.pdf
- The Government's Standard Assessment Procedure for Energy Rating of Dwellings. Available from: www.bre.co.uk/sap2005
- Domestic Heating Compliance Guide – Available from: www.ribabookshops.com
- EN ISO 14713:1999 Protection against corrosion of iron and steel structures – Zinc and aluminium coatings – Guidelines. Available from British Standards Institution (BSI): www.bsi-global.com
- EN 10088-1:2005 Stainless steels. List of stainless steels. Available from British Standards Institution (BSI): www.bsi-global.com
- EN 12975-2:2006 Thermal solar systems and components – Solar collectors – Part 2 Test methods. Available from British Standards Institution (BSI): www.bsi-global.com
- MSC 001 – Installer certification scheme document. Available from www.microgenerationcertification.org
- MCS 002 – Guidance on regulations and directives for microgeneration installations. Available from www.microgenerationcertification.org
- Water Supply (Fittings) Regulations 1999 – Available from: www.opsi.gov.uk

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APPENDIX A: QUALIFICATIONS OF STAFF

The following qualifications may be suitable to satisfy the requirements detailed under item 5:

- NVQ Level 2 plumbing or H&V (Domestic) or equivalent
- Part P for electrical works, limited scope or above
- Recognised solar system design and installation course

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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

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	References to Clear Skies have been removed from clause 4.8 and a link to the MCS website added.	
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