

BS 8660-1:2011



BSI Standards Publication

Gas-fired micro-cogeneration appliances of rated thermal input not exceeding 70 kW net

Part 1: Specification for selection, installation, inspection, commissioning, servicing and maintenance of Stirling engine micro-cogeneration appliances

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Summary of pages

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Foreword

Publishing information

This British Standard is published by BSI and came into effect on 30 November 2011. It was prepared by Panel GSE/30/-/5, *Boilers of rated input not exceeding 70kW and hot water supply*, under the authority of Technical Committee GSE/30, *Gas installations (1st, 2nd and 3rd family gases)*. A list of organizations represented on this committee can be obtained on request to its secretary.

Information about this document

BS 8660, *Gas-fired micro-cogeneration appliances of rated thermal input not exceeding 70 kW net*, will eventually comprise the following parts.

Part 1: Specification for selection, installation, inspection, commissioning, servicing and maintenance of Stirling engine micro-cogeneration appliances.

Part 2: Specification for selection, installation, inspection, commissioning, servicing and maintenance of Fuel Cell micro-cogeneration appliances.

Part 3: Specification for selection, installation, inspection, commissioning, servicing and maintenance of Organic Rankine Cycle micro-cogeneration appliances.

The structure follows the approach used in other gas installation standards.

Requirements, with corresponding commentary, cover equipment selection and pre-installation, installation and post-installation, to which maintenance has been added as a specific detail.

In line with BS 5440-1, this standard acknowledges that European work on chimney standards has brought about the need in British Standards to redefine chimney concepts and adopt common terminology consistent with the range of products used across the whole European community (the general requirements for which are specified in BS EN 1443) where a chimney is treated as a structure containing a flue (the passageway) and possibly a liner (inner wall), insulation and an outer wall. The common terminology in UK industry, which has regarded a chimney as a masonry structure generally associated with solid fuel appliances, has been superseded.

Use of this document

The requirements of this specification are supported by commentary, often in the form of recommendations. To comply with this specification, it is necessary to comply with all its requirements. The operative may depart from recommendations, but would be expected to have good reasons for doing so.

This standard recognizes that manufacturers' instructions (assessed at the time of CE type testing as resulting in at least an equivalent level of safety) might specify a method of installation, testing, commissioning, servicing or maintenance which differs in points of detail from this standard. It is important that the manufacturer's instructions are followed.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is "shall".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users of the standard are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

Attention is drawn to the following statutory regulations.

- The Gas Safety (Installation and Use) Regulations 1998 (GSIUR) [1]
- Gas Safety (Installation and Use) Regulations 1994, as amended and applied by the Gas Safety (Application) (Isle of Man) Order 1996 [2]
- The Gas Safety (Installation and Use) Regulations (Northern Ireland) 2004 [3]
- The Health and Safety (Gas) (Guernsey) Ordinance 2006 [4]
- The Gas Appliance (Safety) Regulations 1995 [5]
- The Building Regulations 2000 (England and Wales), as amended [6]
- The Building Regulations (Northern Ireland) 2000, as amended [7]
- The Building (Scotland) Regulations 2004, as amended [8]
- The Building Regulations 2007 (for the Isle of Man) [9]
- The Water Supply (Water Fittings) Regulations 1999, as amended [10]
- The Electrical Safety, Quality and Continuity Regulations 2002 [11]
- The Electrical Equipment (Safety) Regulations 1994 [12]
- Electromagnetic Compatibility Regulations 2006 [13]

1 Scope

This part of BS 8660 specifies requirements for the selection, installation, inspection, commissioning, servicing and maintenance of room-sealed gas-fired Stirling engine micro-cogeneration appliances and their protection devices designed to operate in parallel with public low-voltage distribution networks.

NOTE 1 Sometimes micro-cogeneration appliances are referred to as small-scale embedded generators (SSEG), e.g. in Engineering Recommendation G83/1/1.

NOTE 2 A room-sealed appliance is designated as Type C in PD CEN/TR 1749.

The term “micro-cogeneration appliance” refers to equipment that:

- is rated up to and including 16 A per phase, single or multiphase 230/400 V a.c.;
- has a total rated heat input not exceeding 70 kW, based on net calorific value;
- utilizes 1st, 2nd or 3rd family gases and is designed to operate in the condensing mode for the heating of domestic dwellings, including domestic dwellings in commercial premises, by the circulation of heated water in open or closed systems;
- has been shown to meet the type verification tests in the appropriate annex of Engineering Recommendation G83/1/1;
- carries a CE mark (see 6.2.1).

This standard does not apply to:

- micro-cogeneration appliances with a rated input of over 70 kW;
- groups of micro-cogeneration appliances with individual ratings of less than 70 kW with an aggregate input of greater than 70 kW.

NOTE 3 Groups of micro-cogeneration appliances with individual ratings of less than 70 kW, but with a maximum aggregate input of ≤ 70 kW, may be installed to this standard but specialist advice on the system design, installation and control needs to be sought from the appliance manufacturer.

It is not applicable to the detailed design and installation of the whole heating system, which is specified in BS EN 12828:2003 (incorporating corrigendum January 2009), BS EN 12831:2003 (incorporating corrigendum January 2009) and BS EN 14336:2004 (incorporating corrigendum January 2009).

NOTE 4 With the publication of BS EN 12828, BS EN 12831 and BS EN 14336, BS 5449 has been withdrawn. These standards are not aligned to UK design and installation practices; they cover commercial as well as domestic heating systems and exclude hot water. Consequently, these standards include national annexes covering all the relevant material from BS 5449.

NOTE 5 In this standard, heat input is expressed in terms of net calorific values (CV), unless stated otherwise. The ratio of gross to net heat input is approximately 1.11:1 for natural gas, 1.09:1 for propane, and 1.08:1 for butane.

NOTE 6 It is essential that persons carrying out the installation of any micro-cogeneration appliances are competent to do so. Clause 4 gives information on competence.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 476-22, *Fire tests on building materials and structures – Part 22: Methods for determination of the fire resistance of non-loadbearing elements of construction*

BS 1179, *Glossary of terms used in the gas industry*

BS 1179-6, *Glossary of terms used in the gas industry – Part 6: Combustion and utilization including installation at consumers' premises*

BS 5422:2009, *Method for specifying thermal insulating materials for pipes, tanks, vessels, ductwork and equipment operating within the temperature range –40 °C to +700 °C*

BS 5440-1, *Flueing and ventilation for gas appliances of rated input not exceeding 70 kW net (1st, 2nd and 3rd family gases) – Part 1: Specification for installation of gas appliances to chimneys and for maintenance of chimneys*

BS 5440-2, *Installation and maintenance of flues and ventilation for gas appliances of rated input not exceeding 70 kW net (1st, 2nd and 3rd family gases) – Part 2: Specification for installation and maintenance of ventilation for gas appliances*

BS 5482-1, *Code of practice for domestic butane- and propane-gas-burning installations – Part 1: Installations at permanent dwellings, residential park homes and commercial premises, with installation pipework sizes not exceeding DN 25 for steel and DN 28 for corrugated stainless steel or copper*

BS 5482-2, *Code of practice for domestic butane- and propane-gas-burning installations – Part 2: Installations in caravans and non-permanent dwellings*

BS 5970, *Code of practice for thermal insulation of pipework and equipment in the temperature range of –100 °C to +870 °C*

BS 6700, *Design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages – Specification*

BS 6891, *Installation of low pressure gas pipework of up to 35 mm (R1¼) in domestic premises (2nd family gas) – Specification*

BS 7671, *Requirements for electrical installations – IEE Wiring Regulations*

BS 7927, *Heating appliances for domestic applications – Portable apparatus designed to detect and measure specific combustion flue gas products – Requirements (withdrawn)*

BS EN 1491, *Building valves – Expansion valves – Tests and requirements*

BS EN 12828:2003 (incorporating corrigendum January 2009), *Heating systems in buildings – Design for water-based heating systems*

BS EN 12831:2003 (incorporating corrigendum January 2009), *Heating systems in buildings – Method of calculation of the design heat load*

BS EN 13831, *Closed expansion vessels with built in diaphragm for installation in water*

BS EN 14336:2004 (incorporating corrigendum January 2009), *Heating systems in buildings – Installation and commissioning of water based heating systems*

BS EN 50379-3, *Specification for portable electrical apparatus designed to measure combustion flue gas parameters of heating appliances – Part 3: Performance requirements for apparatus used in non-statutory servicing of gas fired heating appliances*

NOTE BS EN 50379-3 has superseded BS 7927, which is withdrawn.

BS EN ISO 4126-1, Safety devices for protection against excessive pressure – Part 1: Safety valves

PD 5482-3, Code of practice for domestic butane- and propane-gas-burning installations – Part 3: Installations in boats, yachts and other vessels

IGEM/UP/2, Edition 2, Installation pipework on industrial and commercial premises ¹⁾

UKLPG, Code of Practice 22 – LPG Piping System Design and Installation ²⁾

Engineering Recommendation G83/1/1 June 2008, Recommendations for the connection of Small-scale Embedded Generators (Up to 16A per Phase) in Parallel with Public Low-Voltage Distribution Networks ³⁾

3 Terms and definitions

For the purposes of this British Standard, the terms and definitions given in BS 1179, BS 1179-6 and the following apply.

3.1 chimney

structure consisting of a wall or walls enclosing a flue or flues

NOTE This includes chimneys of all materials (e.g. metal, masonry or plastic) for use with either open-flued or room-sealed appliances.

3.2 cogeneration

simultaneous generation of thermal and electrical energy in one process

3.3 controls

internal control system governing the safe operation of the primary heat source and associated equipment of the micro-cogeneration appliance

3.4 distributing main

low voltage part of the electric power system used for the transfer of electricity within an area of consumption to consumers

3.5 distribution network operator

DNO

organization that owns or operates a distribution network and is responsible for confirming requirements for the connection of a micro-cogeneration appliance to that network

NOTE 1 A DNO might also be referred to as a “distributor”.

NOTE 2 See <http://energynetworks.squarespace.com/electricity-distribution-map/> for locations of DNOs.

3.6 domestic dwelling

self-contained unit designed to accommodate a single household

3.7 flue

passage for conveying combustion products to the outside air

3.8 flue duct

duct containing the flue of a chimney configuration

¹⁾ Institution of Gas Engineers and Managers. Kegworth.

²⁾ UKLPG. Kenilworth.

³⁾ Energy Networks Association Limited. London.

3.9 greywater

water originating from the mains water supply that has been used for bathing or washing, washing dishes or laundering clothes

3.10 hot water storage combination unit

either:

- a) hot-water storage vessel with a cold water feed cistern immediately above it, the two being fabricated together as a compact unit; or
- b) hot-water storage vessel with a cold water feed cistern beside it or inside it

3.11 micro-cogeneration

cogeneration with a maximum electrical output below 50 kW_e

3.12 micro-cogeneration appliances**3.12.1 micro-cogeneration appliance**

product placed on the market by the manufacturer to deliver safely and effectively heating, electrical power and, where applicable, domestic hot water

NOTE This product may take the form of:

- a) a single package, packed by the appliance manufacturer, containing all the components necessary for the complete appliance;
- b) a number of packages, packed by the appliance manufacturer, containing all the components necessary for the complete appliance; or
- c) a number of components specified by the appliance manufacturer as necessary to make the complete appliance, some of which come direct from other than the appliance manufacturer,

comprising as relevant:

- i) primary heat and power generator;
- ii) supplementary heat generator;
- iii) combustion air supply and product evacuation ducts;
- iv) thermal store.

3.12.2 combination micro-cogeneration appliance

category of micro-cogeneration appliance providing space and water heating, in which the domestic hot water (DHW) service is provided wholly from within the appliance

NOTE Provision of the DHW may utilize either a DHW storage tank or heat exchange coils within the appliance.

3.12.3 condensing micro-cogeneration appliance

micro-cogeneration appliance designed to make use of the latent heat released by the condensation of water vapour in the products of combustion and to allow the condensate to leave the appliance in liquid phase

NOTE Appliances not so designed or without the means to remove the condensate in liquid phase are non-condensing micro-cogeneration appliances.

3.12.4 heating only micro-cogeneration appliance

category of micro-cogeneration appliance providing space heating only (no DHW service)

3.12.5 indirect hot water micro-cogeneration appliance

category of micro-cogeneration appliance providing space and water heating, intended for connection to a separate DHW storage vessel or thermal store

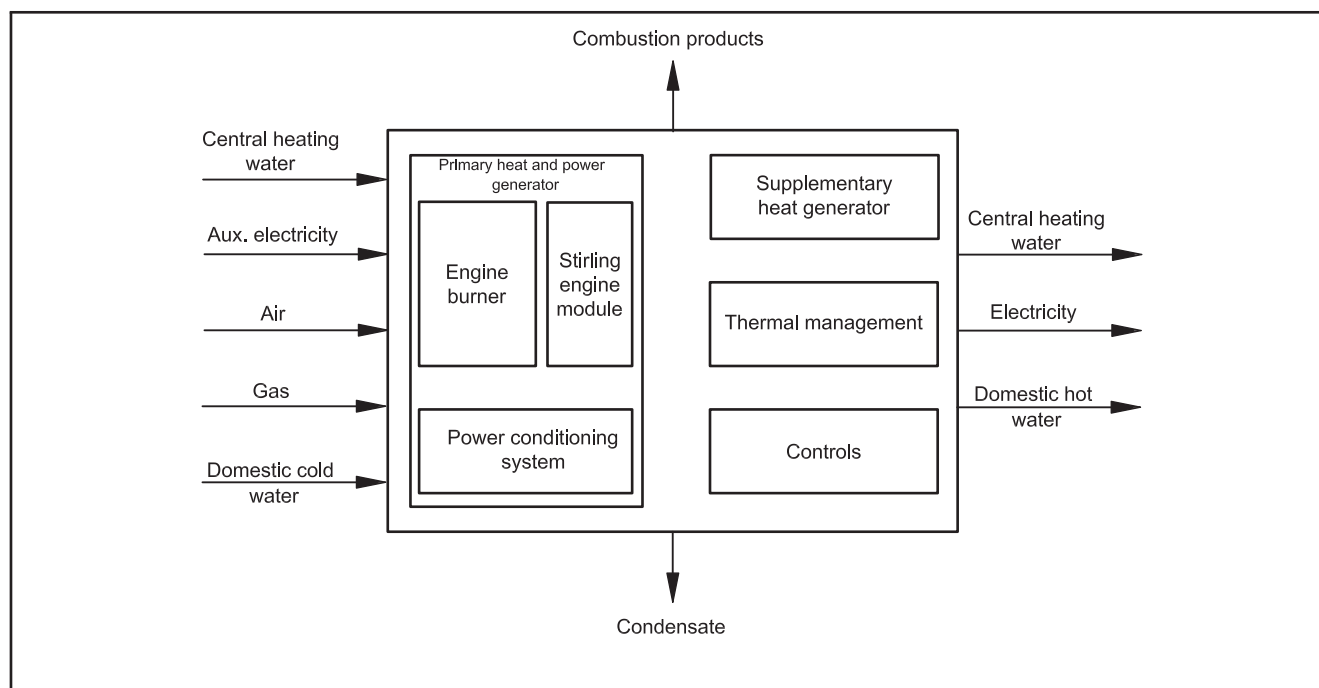
NOTE The DHW storage vessel or thermal store is not part of the appliance, but is connected to it (see Commentary on 6.5).

3.12.6 Stirling engine micro-cogeneration appliance

micro-cogeneration appliance that includes a Stirling engine module which thermodynamically converts a proportion of absorbed thermal energy to electrical energy, the remaining energy being transferred to the thermal management system

NOTE See Figure 1 for a diagrammatic description of a typical Stirling engine micro-cogeneration appliance and Annex A for further information on how a Stirling engine micro-cogeneration appliance works.

Figure 1 Typical set-up for a Stirling engine micro-cogeneration appliance



3.13 micro-cogeneration appliance compartment

enclosure specifically designed or adapted to house one or more micro-cogeneration appliances, and which is not a habitable space

3.14 open system

heating system which is open to the atmosphere and incorporates a feed and expansion cistern

3.15 operative

person who installs, inspects, commissions, services or maintains a gas-fired micro-cogeneration appliance

NOTE See Clause 4.

3.16 pluming

visible cloud formed when products of combustion exit from a chimney and are cooled below the dew point by mixing with external air

3.17 plume management kit

chimney component designed to manage the discharge of the products of combustion such that any plume will not cause a nuisance

3.18 power conditioning system

equipment used to change electrical voltage level or waveform, or otherwise alter or regulate the electrical output of the primary heat source, to make it suitable and safe for export to other components within or outside the appliance

NOTE The output of the power conditioning system is the point of measurement for the amount and quality of the produced electricity.

3.19 pressure-relief valve

pressure actuated valve which opens automatically at a pre-set pressure to discharge fluid

3.20 primary heat source

preferential heat generator producing electricity

NOTE That is, a Stirling engine micro-cogeneration appliance.

3.21 rated output

useful heat or electrical output declared by the manufacturer

3.22 residual current device**RCD**

mechanical switching device or association of devices intended to cause the opening of contacts when the residual current attains a given value under specified conditions

3.23 residual current operated circuit-breaker with integral overcurrent protection**RCBO**

residual current operated switching device designed to perform the functions of protection against overload and/or short-circuit

3.24 room-sealed micro-cogeneration appliance

micro-cogeneration appliance whose combustion system is sealed from the room in which the appliance is located and which obtains air for combustion from a ventilated uninhabited space within the premises, or from the open air outside the premises, and vents the products of combustion directly to open air outside the premises

NOTE This type of appliance is designated as Type C in PD CEN/TR 1749.

3.25 sealed system

central heating system incorporating a water circuit that is not open to the atmosphere

3.26 supplementary heat source

non-preferential heat generator providing for high demand

NOTE For example, an auxiliary burner.

3.27 terminal

fitting installed at the outlet of a chimney

NOTE A terminal is fitted to assist products of combustion to escape, minimize downdraught and prevent entry of material which might block the flue.

3.28 thermal management

internal system that manages the transfer of the thermal energy of the micro-cogeneration appliance to a heat transfer fluid circulating in a distribution system to which a heat exchanging system(s) is connected that is equipped to transfer the thermal energy into space heating or space heating and DHW

NOTE The heat exchanging system(s) may include a thermal store.

3.29 thermal store

heating reservoir sited mainly in heated water as opposed to the domestic hot water storage in the DHW reservoir

4 Competence

Persons carrying out work that will have an impact on work covered by the scope of this standard shall ensure that they have the competence relevant for the task such as not to compromise the requirements/recommendations of this standard and, in particular, the safe installation, commissioning and operation of gas equipment.

COMMENTARY ON 4

Competence requires sufficient knowledge, practical skill and experience to carry out the job in hand safely, with due regard to good working practice. The installation should also be left in a safe condition for use. Knowledge should be kept up-to-date with changes in law, technology and safe working practice.

There are five principal aspects to competence for micro-cogeneration appliances; these are:

- a) knowledge of the relevant Building Regulations [6,7,8,9] for domestic premises;*
- b) ability to ensure that electrical work in dwellings is designed, installed, inspected and tested to the standard required by BS 7671;*
- c) knowledge of the Electrical Safety, Quality and Continuity Regulations 2002 [11], particularly Regulation 22 and the exemption in Regulation 22(2);*
- d) knowledge of Engineering Recommendation G83/1/1;*
- e) for "gas work", registration with an appropriate authority.*

For electrical work [item d)] associated with the connection of a micro-cogeneration appliance to a distributing main, a competent person is one who has sufficient skills and training to apply safe methods of work in compliance with the requirements of Engineering Recommendation G83/1/1.

It is a statutory requirement in Great Britain, Isle of Man, Northern Ireland and Guernsey (see Table 1) that all "gas work" [item e)] be carried out by a business or self-employed person(s) that is a member of a "class of persons" registered with a registration body which has been approved by an approval body (see Table 1) to operate and maintain such a register.

At the time of publication, the only body with approval to operate and maintain a register of individuals/businesses who are "members of a class of persons" is the Gas Safe Register. Thus, it is essential that all businesses or self-employed gas engineers are registered with the Gas Safe Register.

The qualifications which persons need to have to be deemed competent to carry out gas work are given in Table 2.

Table 1 Approval bodies and statutory regulations by country/territory

Country/ territory	Approval body	Statutory regulations
Great Britain	Health and Safety Executive (HSE)	Gas Safety (Installation and Use) Regulations 1998 [1]
Isle of Man	Health and Safety at Work Inspectorate (HSWI)	Gas Safety (Installation and Use) Regulations 1994, as amended and applied by the Gas Safety (Application) (Isle of Man) Order 1996 [2]
Northern Ireland	Health and Safety Executive Northern Ireland (HSENI)	Gas Safety (Installation and Use) Regulations (Northern Ireland) 2004 [3]
Guernsey	Health and Safety Executive for the States of Guernsey [HSE (Guernsey)]	Health and Safety (Gas) (Guernsey) Ordinance 2006 [4]

Table 2 Competence requirements by country/territory

Qualifications	Great Britain and Isle of Man	Northern Ireland	Guernsey
Current certificate(s) of competence in the type of gas work to be conducted, issued by an awarding body accredited by the United Kingdom Accreditation Service (UKAS) (ACS certification)	✓	✓	✓
National/Scottish Vocational Qualification (N/SVQ accredited by Ofqual), which is aligned in matters of gas safety	✓	✓	✓
National/Scottish Vocational Qualification (N/SVQ accredited by Ofqual), which is aligned under the HSC ACoP arrangement ^{A)} as approved with the registration body	✓	✓	✗
Any other scheme recognized by the gas registration body for registration purposes	✓	✓	✓

^{A)} Guidance on the individual competence required for gas work is given in the Health and Safety Commission's Approved Code of Practice (ACoP) (COP 20) "Standards of training in safe gas installation" [14].

5 Environmental considerations

As part of the planning process, consideration shall be given to the following.

- Disposal/recycling of existing appliances and systems materials that are to be removed.
- Disposal/recycling of new appliance and system components packaging.
- Minimization of energy usage through appliance selection (see 6.2.1).
- Minimization of harmful emissions discharge (see 6.3.2 and 6.3.4).

6 Selection of equipment and pre-installation

6.1 Exchange of information and planning

Both for a first-time installation in a new dwelling and when replacing a boiler in an existing heating system, those concerned with the selection of the appropriate micro-cogeneration appliance and the design of the system shall:

- be aware of the standards and regulations that govern how the installer carries out the installation;
- collaborate with the installer, both at the planning stage and during the execution of the work;
- collaborate with the customer regarding notifying the electricity supplier of

the installation of the appliance and the provision of a suitable meter [see item e) under "Consultation with official bodies" in the Commentary on 6.1];

- d) collaborate with the customer and the installer over the location of the micro-cogeneration appliance (see 6.3.2);
- e) be aware that a Stirling engine micro-cogeneration appliance is not to be installed where the electrical supply is controlled by a prepayment meter [see 6.6a) and b)].

COMMENTARY ON 6.1

In the United Kingdom there is a legal requirement (under the Electrical Safety, Quality and Continuity Regulations [11]) for the installer to notify the DNO at or before the time of the installation of the micro-cogeneration appliance (referred to as "inform and fit").

Engineering Recommendation G83/1/1 explains the "inform and fit" procedure and contains recommendations on the procedures to follow regarding discussions with the DNO in the case of single installation and multiple/planned connections.

A single installation is the installation of a single micro-cogeneration appliance in a single customer's installation; multiple/planned installation is a planned installation project where the proposal is to install multiple micro-cogeneration appliances in a close geographical region.

Particular matters that should be considered when carrying out new or replacement installations are:

Consultation with official bodies

The following official bodies might need to be consulted for the reasons given.

- a) *The local authority, about building regulations and planning application requirements.*
- b) *The fire authority, to establish compliance with relevant fire precautionary requirements, and the fire insurers, for notification of any proposed changes in the means of heating.*
- c) *The Health and Safety Executive (HSE), to establish compliance with health and safety requirements in commercial premises, particularly with regard to safety requirements which are not fulfilled as an integral part of the installation.*
- d) *The water authority/company, about the requirements of the Water Supply (Water Fittings) Regulations, as amended [10], or relevant by-laws.*
- e) *The electricity supplier (to be contacted by the customer) concerning the provision of a new meter for the following reasons:*
 - 1) *the customer will have a contract with an electricity supplier for the purchase of electricity monitored through a meter;*
 - 2) *in order for the customer to take full advantage of any "Feed-In Tariffs" available;*

NOTE 1 These tariffs reward customers for the energy they generate whether used by the customer or exported back into the network.

- 3) *when the micro-cogeneration appliance generates more electricity than is being used in the premises, the surplus will go back into the mains and the reverse flow of electricity can have an impact on the customer's existing meter as follows:*
 - *some meters are fitted with a backstop which prevents the energy register from running backwards, so the consumer is exporting electricity but receives no compensation for it;*

- some meters with a backstop have a flag that is tripped by reverse power flow, which could result in the consumer being accused of stealing energy;
- some older meters might not have a backstop so that the register will run backwards while energy is being exported, effectively crediting the consumer with energy at the rate at which they normally pay for the electricity; this could be treated by the electricity supplier as a form of theft.

Liaison between the various trades

Liaison between the various trades carrying out the work is essential for a safe and efficient installation, in particular to ensure:

- a) *the availability and suitability of gas (see 7.5), electrical (see 6.6 and 7.6) and water supplies (see 7.7);*
- b) *the means of isolation (see 7.6.6), earthing (see 7.6.3 or 7.6.4, as appropriate) and safety labels (see 7.6.7) are present;*
- c) *provision of forms used to notify the DNO that a micro-cogeneration appliance has been installed;*

NOTE 2 Appendices 1, 2, and 3 of Engineering Recommendation G83/1/1 provide respectively:

- *connection ("inform and fit") procedure flow chart;*
 - *application form to a DNO for connection;*
 - *micro-cogeneration appliance form for confirmation of installation and commissioning;*
- d) *that mains wiring external to the micro-cogeneration appliance conforms to BS 7671 and any local regulations;*
 - e) *connection to the mains is made in accordance with the latest edition of Engineering Recommendation G83/1/1;*
 - f) *the heat requirements (see 6.2.1 and 6.5);*
 - g) *the compatibility of heat emitters with current needs;*
 - h) *the physical size, design and position of the micro-cogeneration appliance, and its relationship to structural support, noise (see 7.3.12) and vibration control, and combustible materials;*

NOTE 3 Some installations will involve preliminary structural work which needs to be completed at the building carcass stage. Suitable bases are required for floor-standing appliances.

- i) *the type of building, form of construction (e.g. timber framed), and the probable position of fixtures, furniture and curtains;*

NOTE 4 Information on gas installations in timber-framed and light steel-framed buildings is given in IGE/UP/7, Edition 2.

NOTE 5 Information on gas installations in flats and other multi-dwelling buildings is given in IGE/G/5.

- j) *the size, height, type, support and route of the chimney and the position of the chimney outlet, including the possible consequences of any plumbing; particular notice is drawn to the advice in:*
 - *BS 5440-1 on the connection to SE-duct, U-duct and shared chimneys;*
 - *Technical Bulletin 008 [15], as published by Gas Safe Register, concerning the requirement in the Gas Safety (Installation and Use) Regulations [1] that flues are examined prior to initial commissioning of the appliance and during routine servicing or maintenance of the appliance;*

- k) *the position of any drains for condensate or pressure/temperature-relief valve discharge;*
- l) *the manufacturer's instructions regarding water hardness; unless the manufacturer's instructions say otherwise, where the mains water total hardness (as CaCO₃) exceeds 200 ppm, provisions should be made to treat the feed water to the hot water circuit of combination appliances to reduce the rate of accumulation of limescale;*
- m) *the compatibility of the micro-cogeneration appliance with any system controls (see 7.8);*
- n) *the system controls for energy conservation and comfort, in particular to avoid unnecessary cycling of the micro-cogeneration appliance and to conform to the Building Regulations (see Foreword and 7.8);*
- o) *in a replacement situation whether the pump is adequate for the new appliance and is located so as to avoid entrainment of air or discharge of water from the system;*
- p) *whether the system pipework is adequately sized;*
- q) *the need for the central heating system to be thoroughly cleansed and flushed out before installing a new appliance (see 7.7.4).*

6.2 Selection of micro-cogeneration appliance

6.2.1 General

Any micro-cogeneration appliance (new or previously used) selected for installation shall carry a CE mark.

The micro-cogeneration appliance shall only be connected to and supplied with the gas for which it was designed.

Conversion to another gas, if necessary, shall be carried out strictly in accordance with the micro-cogeneration appliance manufacturer's instructions, using the manufacturer's supplied kit of parts.

The micro-cogeneration appliance shall only be connected to external control devices approved by the micro-cogeneration appliance manufacturer.

The micro-cogeneration appliance shall be matched to the heat load of the property in accordance with the manufacturer's instructions (see Annex B).

COMMENTARY ON 6.2.1

For selection of a gas-fired micro-cogeneration appliance in England, Wales and Northern Ireland attention is drawn to The DCLG publication, Domestic Building Services Compliance Guide – Compliance with Approved Documents L1A:New dwellings and L1B:Existing dwellings [16]; in particular Section 13, Micro-combined heat and power systems (micro-CHP).

For selection of a gas-fired micro-cogeneration appliance in Scotland, attention is also drawn to the Building (Scotland) Regulations 2004 Domestic Technical Handbook, Section 6 (Energy) [17].

Similar requirements might apply in other areas of the UK.

The HSE publication, Safety in the installation and use of gas systems and appliances [18] should also be consulted.

The installer should ensure that the micro-cogeneration appliance carries the CE mark on the data plate and that the data plate and the packaging are marked with at least the following information:

- a) *the letters "GB";*
- b) *the type of gas and the pressure of utilization indicated as follows:*

- 1) "G20 and/or natural gas 20 mbar" for a micro-cogeneration appliance adjusted for natural gas;
- 2) "G31 and/or propane 37 mbar" for a micro-cogeneration appliance adjusted for propane;
- 3) "G30 and/or butane 29 mbar" for a micro-cogeneration appliance adjusted for butane;
- 4) "G30, G31 and/or butane/propane 29/37 mbar" for a micro-cogeneration appliance which will burn either butane or propane at the correct pressure.

The data plate of a CE-marked micro-cogeneration appliance will carry the designation I2H, I3P, I3B, or I3+, respectively, for items 1), 2), 3) or 4). Where a micro-cogeneration appliance data plate carries the letters "Cat II" or "II", followed by the gas type designations P, B, then the micro-cogeneration appliance can be used for propane or butane when adjusted and converted to do so.

If there is any doubt as to the suitability of a micro-cogeneration appliance for a particular gas, the manufacturer should be consulted.

CE marking of a micro-cogeneration appliance in terms of electrical aspects signifies:

- a declaration by the manufacturer of compliance with the Electrical Equipment (Safety) Regulations 1994 [12] and the Electromagnetic Compatibility Regulations 2006 [13];
- that the appliance will be satisfactory in an installation in terms of the power factor, generation of harmonics, and voltage distribution arising from starting current and synchronization;
- that the synchronizing system is automatic and of a type that considers frequency, phase and voltage magnitude;
- that the manufacturer can produce documentation confirming the acceptability of the means of protection against operation in the event of loss of the mains supply as required by G83/1/1 or BS EN 50438.

The operative should check the data provided with the micro-cogeneration appliance to confirm that the micro-cogeneration appliance is appropriate for the installation, and should confirm the basis on which the heat input rating is quoted, i.e. gross or net. The ratio of gross to net heat input is approximately 1.11:1 for natural gas, 1.09:1 for propane and 1.08:1 for butane.

Further information on the labelling of gas appliances is given in DD 221:1997.

6.2.2 Micro-cogeneration appliances for sealed systems

Micro-cogeneration appliances intended to be used in a sealed system shall be selected from those specifically designated for this purpose by the manufacturer.

COMMENTARY ON 6.2.2

Micro-cogeneration appliances used in sealed systems should incorporate appropriate protection devices.

6.3 Condensing micro-cogeneration appliances

6.3.1 General

Micro-cogeneration appliances designed to be used in the condensing mode shall be installed in accordance with the manufacturer's installation instructions, or, if there are no specific instructions, in accordance with 6.3.2, 6.3.3, 6.3.4, 6.3.5, 6.3.6 and 6.4.

COMMENTARY ON 6.3.1

The manufacturer's installation instructions might contain particular requirements for the condensing micro-cogeneration appliance, e.g. a means for disposal of condensate, the air-gas ratio valve setting and the water temperature operating range.

6.3.2 Location**6.3.2.1 General**

The following issues shall be considered when determining the suitability of a particular location:

- a) access to the condensate discharge termination for the condensate drainage pipe (see 6.3.3);
- b) chimney outlet location (see 6.3.4);
- c) air supply and ambient conditions (see 7.1 and 7.3.11, respectively);
- d) ventilation (see 7.1 and 7.3.2.3);
- e) space, both for installation and subsequent service access (see 7.3.1);
- f) operating noise (see 7.3.12);
- g) support for the installed weight of the appliance (see 7.3.1 and the final paragraph of the Commentary on 7.3.12);
- h) specific requirements for the appliance siting position chosen (see 7.3.2 to 7.3.10 inclusive).

COMMENTARY ON 6.3.2.1

Room-sealed micro-cogeneration appliances may be installed in any room or space. It is not recommended that any type of micro-cogeneration appliance be installed in an under-stairs cupboard, bathroom or shower-room, bedroom or bed-sitting room, or within a toilet or cloakroom, but such installations are acceptable subject to the requirements of 7.3.4 to 7.3.7.

BS 6400, Parts 1 to 3, refers to separation distances and guarding between gas and electric services.

Where a micro-cogeneration appliance is located in an exposed position, such as an external location, roof space or an unheated garage, consideration should be given to frost protection.

There is no restriction on the type of micro-cogeneration appliance that can be installed in a private garage, except where the manufacturer states otherwise. Great care is required in the location of a micro-cogeneration appliance in any premises where concentrations of flammable vapour could accumulate, e.g. commercial garages and associated workshops.

6.3.2.2 3rd family gases

A micro-cogeneration appliance for use with 3rd family gases shall not be installed in a room or internal space situated below ground level, e.g. a basement or cellar.

COMMENTARY ON 6.3.2.2

This does not preclude the installation of such appliances in rooms which are basements with respect to one side of the building but open to ground level on the opposite side.

6.3.3 Selection of condensate discharge point

The possibility of the condensate drainage pipe freezing downstream of the connection point to the micro-cogeneration appliance during prolonged spells of extremely cold weather shall be considered when choosing the siting of the condensate discharge point.

Wherever possible, the condensate drainage pipe shall be terminated at an internal foul water discharge point (see 6.3.6.2).

Where gravity discharge to an internal foul water discharge point is not possible, e.g. the discharge point is above the micro-cogeneration appliance location, or access is obstructed by a doorway, consideration shall be given to the use of a proprietary condensate pump of a specification recommended by the micro-cogeneration appliance or pump manufacturer.

Where gravity or pump discharge to an internal foul water discharge is not possible due to impractical very long pipe runs being required to reach a suitable internal discharge point, an external discharge point can be used (see 6.3.6.3)

COMMENTARY ON 6.3.3

Winters in the UK can experience prolonged spells of extremely cold weather – down to minus 20 °C in many areas. This can cause freezing of the condensate in the condensate discharge pipe causing the pipe to become blocked with ice and the micro-cogeneration appliance to shut down. Whilst there can never be a guarantee (under widespread and prolonged very low temperatures) that the condensate discharge will not freeze, parts of the condensate discharge pipe that are located externally are particularly at risk of freezing; hence the recommendation to use an internal foul water discharge point wherever possible.

A slightly longer pipe run, for example, to an internal soil stack, can be preferable to a shorter run connecting into a kitchen waste pipe discharging directly through the wall to an external drain.

Examples of where a condensate pump can provide solutions are where a micro-cogeneration appliance is to be installed in a basement or below ground level or conversely on an internal wall or in an airing cupboard. Manufacturers of condensate pumps will be able to provide detailed suggestions for the optimum disposal routes.

6.3.4 The siting of the chimney outlet

NOTE Chimney outlet was originally referred to as “terminal” in UK standards.

Where it is considered that the plume from a chimney outlet might cause a nuisance to the user of the appliance or a neighbour, reference shall be made to the micro-cogeneration appliance manufacturer's instructions for specialist advice on how to redirect the chimney outlet, for example by the:

- a) partial rotation of the chimney terminal;
- b) fitting of a deflector elbow;
- c) use of a kit that provides high level termination.

In particular, the potential for the plume to cross the following shall be avoided:

- 1) a public footpath;
- 2) a frequently used access route;
- 3) a frequently used area (such as a patio);
- 4) a neighbouring dwelling.

The terminal shall not be directed towards a window or door, or be sited close to a facing wall, boundary fence or neighbouring property.