

Specification for installation of gas-fired boilers of rated input not exceeding 70 kW net

ICS 91.140.10

Committees responsible for this British Standard

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- BG plc
- British Flue and Chimney Manufacturers' Association
- Centrica
- Combustion Engineers' Association
- Consumer Policy Committee of BSI
- Council for Registered Gas Installers
- Department of Trade and Industry
- Gas Consumers' Council
- Health and Safety Executive
- Institute of Domestic Heating and Environmental Engineers
- Institution of Gas Engineers
- Liquified Petroleum Gas Industry Technical Association
- Society of British Gas Industries
- Co-opted members

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Foreword

This British Standard has been prepared by Technical Committee GSE/30. It supersedes BS 6798:1987, which is withdrawn.

The start and finish of text introduced or altered by Amendment No. 1 is indicated in the text by tags **A1** **A1**.

The structure has been modified to follow the systematic approach used in other gas installation standards. Requirements, with corresponding commentary and recommendations, are organized under the main headings of equipment selection and pre-installation, installation, and post-installation.

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

This standard allows manufacturers' instructions to specify a method of installation, testing, commissioning or maintenance which differs in points of detail from this standard. This reference to manufacturers' instructions is allowed only where it will result in at least an equivalent level of safety. In such circumstances, it is important that the manufacturer's instructions are followed.

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

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Attention is drawn to the following statutory regulations. The regulations may be amended from time to time, and whichever regulations are in force at the time an installation is carried out are to be complied with. The commentary in this British Standard reflects the state of the regulations in 2005.

a) ***The Gas Safety (Installation and Use) Regulations*** [1].

These control all aspects of the ways gas-fired systems are installed, maintained and used, mainly in domestic premises, and the classes of persons who may undertake gas work.

b) ***Building regulations*** (for the appropriate legislative region).

These control work carried out in the construction of new buildings or the extension of existing buildings. Detailed advice for England and Wales is given in approved documents [2], and for Northern Ireland, in technical booklets [3]. The Building (Scotland) Regulations 2004 [4] are functional Regulations and detailed guidance on these Regulations, with regard to the environment, is given in the Technical Handbook for domestic application, section 3 [4a].

c) ***The Water Supply (Water fittings) Regulations 1999*** (as amended) [5] or relevant Byelaws.

d) ***The Health and Safety at Work etc. Act 1974*** (as amended) [6].

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 27 and a back cover.

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1 Scope

This British Standard specifies requirements for the selection, installation, inspection and commissioning of gas-fired boilers for central heating and other purposes, which have a total rated heat input not exceeding 70 kW, based on net calorific value. This includes cookers with integral boilers used to provide central heating.

It applies to boilers utilizing 1st, 2nd or 3rd family gases designed to operate in the condensing or non-condensing mode for the heating of domestic or commercial premises by the circulation of heated water in open or closed systems.

This standard does not apply to boilers with a rated input of over 70 kW, nor to groups of boilers with individual ratings of 70 kW or less but with aggregate inputs of over 70 kW as specified in BS 6644. It does not cover the detailed design and installation of the whole heating system, which is specified in BS 5449.

NOTE 1 The installation of boilers with a rated input greater than 70 kW is covered by BS 6644. Additional requirements for the installation of back boiler units are described in BS 5871-1.

This standard applies to boilers which carry a CE mark and also to used boilers which do not carry the CE mark (see 4.2.1).

NOTE 2 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 3 It is essential that persons carrying out the installation of any gas appliance be competent to do so. Annex A gives information about the legal requirements which relate to approved installers of gas appliances.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this British Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the publication referred to 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 1179:1967, *Glossary of terms used in the gas industry.*

BS 1179-6:1980, *Glossary of terms used in the gas industry — Part 6: Combustion and utilization including installation at consumers' premises.*

BS 4814, *Specification for expansion vessels using an internal diaphragm, for sealed hot water heating systems.*

BS 5422:1990, *Method for specifying thermal insulating materials on pipes, ductwork and equipment (in the temperature range $-40\text{ }^{\circ}\text{C}$ to $+700\text{ }^{\circ}\text{C}$).*

BS 5440-1, *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 1: Specification for installation and maintenance of flues.*

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

BS 5449, *Specification for forced circulation hot water central heating systems for domestic premises.*

BS 5482-1, *Domestic butane- and propane-gas-burning installations — Part 1: Specification for installations at permanent dwellings.*

BS 5482-2, *Domestic butane- and propane-gas-burning installations — Part 2: Installations in caravans and non-permanent dwellings.*

BS 5482-3, *Domestic butane- and propane-gas- burning installations — Part 3: Installations in boats, yachts and other vessels.*

BS 5970, *Code of practice for thermal insulation of pipework and equipment (in the temperature range $-100\text{ }^{\circ}\text{C}$ to $+870\text{ }^{\circ}\text{C}$).*

BS 6283-1, *Safety and control devices for use in hot water systems — Part 1: Specification for expansion valves for pressures up to and including 10 bar.*

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

BS 6759-1, *Safety valves — Part 1: Specification for safety valves for steam and hot water*.

BS 6891, *Specification for installation of low pressure gas pipework of up to 28 mm (R1) in domestic premises (2nd family gas)*.

BS 7671, *Requirements for electrical installations. IEE Wiring Regulations. Sixteenth edition*.

IGE/UP2, *Gas installation pipework, boosters and compressors in industrial and commercial premises*.¹⁾

3 Terms and definitions

For the purposes of this British Standard, the terms and definitions given in BS 1179:1967 and BS 1179-6:1980 apply, together with the following.

3.1

boiler compartment

enclosure specifically designed or adapted to house one or more gas boilers, and which is not a habitable space

3.2

combination boiler

boiler designed to provide domestic hot water and hot water for central heating without the need for additional secondary storage

NOTE A combination boiler may include primary or secondary storage.

3.3

condensing boiler

boiler designed to make use of the latent heat in the combustion products by condensing water vapour within the appliance

3.4

flue pipe

pipe which conveys products of combustion from a boiler to a discharge terminal

3.4a

greywater

“water originating from the mains potable water supply that has been used for bathing or washing, washing dishes . . . or laundering clothes”^{1a)} 

3.5

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.

3.6

installer

person who installs, commissions, services or maintains a gas-fired central heating boiler

3.7

open-flued boiler

boiler designed to be connected to an open-flue system, its combustion air being drawn from the room, space or enclosure in which it is installed

NOTE This type of boiler is designated as “type B” in  PD CR 1749:2001. 

¹⁾  Footnote deleted 

 ^{1a)} Definition from Water Regulations Advisory Scheme publication, *Reclaimed Water Systems. Information about Installing, Modifying or Maintaining Reclaimed Water Systems* (No 9-02-04) [6a]. 

3.8**open system**

central heating system incorporating a water circuit that is open to the atmosphere through a feed cistern and an open vent pipe or via a combined feed and vent pipe

3.9**rated output**

the useful output stated by the manufacturer

3.10**room-sealed boiler**

boiler whose combustion system is sealed from the room in which the boiler 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 which vents the products of combustion directly to open air outside the premises

NOTE This type of boiler is designated as “type C” in  PD CR 1749:2001. 

3.11**sealed system**

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

4 Selection of equipment and pre-installation**4.1 Exchange of information and planning**

Those concerned with the selection of the boiler and the design of the system shall collaborate with the installer, both at the planning stage and during the execution of the work.

COMMENTARY AND RECOMMENDATIONS ON 4.1

General

Liaison between the various trades carrying out the work is essential for a safe and efficient gas boiler installation.

New work

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

- a) the availability of gas, electrical and water supplies;*
- b) the heat requirements (see 4.5);*
- c) the physical size, design and position of the boiler, and its relationship to structural support and to combustible materials;*

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

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

NOTE Information on gas installations in timber-framed housing is given in IGE/UP7 [7].

- e) the size, height, type and route of the flue, and the position of termination, including the possible consequences of any plumbing, together with the materials of construction;*

NOTE Suitable apertures or openings may be required for connection to a built-in flue or for a flue assembly to be installed with the boiler.

- f) the provision of adequate air for combustion and ventilation;*
- g) the position of any drains for condensate or pressure/temperature relief valve discharge.*

Replacement work

When a boiler is being installed as a replacement within an existing system, it is especially important to consider the complete system to ensure that:

- a) the heat emitters are compatible with current needs;
- b) system controls are recommended where necessary for energy conservation and comfort, in particular to avoid unnecessary cycling of the boiler, and to comply with building regulations (see Foreword);
- c) the pump is adequate for the new boiler and is located so as to avoid entrainment of air or discharge of water from the system;
- d) the existing system is cleansed (see 6.2.1.2).

Consultation with official bodies

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

- a) the local authority, with regard to 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, 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, with regard to the Water Supply (Water Fittings) Regulations (as amended) [5] or relevant Byelaws.

4.2 Selection of boiler**4.2.1 General**

A new boiler selected for installation shall carry a CE mark.

A used boiler selected for installation shall either carry a CE mark, or shall conform to an appropriate British Standard.

The boiler shall only be connected to and supplied with the gas for which it was designed.

The installer shall ensure that the boiler is correctly adjusted in accordance with the manufacturer's instructions. Conversion to another gas, if necessary, shall be carried out strictly in accordance with the boiler manufacturer's instructions, using the manufacturer's supplied kit of parts.

The boiler shall only be fitted with external control devices, e.g. flue dampers or economizers, as approved by the boiler manufacturer. The boiler selected shall be suitable for use with any existing control system to which it is fitted.

COMMENTARY AND RECOMMENDATIONS ON 4.2.1

The HSE publication Safety in the installation and use of gas systems and appliances [8] should be consulted.

For CE marked boilers

The installer should ensure that boilers carry the CE mark on the data plate and that the boiler 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 boiler adjusted for natural gas;
 - 2) "G31 and/or propane 37 mbar" for a boiler adjusted for propane;
 - 3) "G30 and/or butane 29 mbar" for a boiler adjusted for butane;
 - 4) "G30, G31 and/or butane/propane 29/37 mbar" for a boiler which will burn either butane or propane at the correct pressure.

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

For boilers without a CE mark

If a used boiler which does not carry the CE mark is to be installed, the installer should satisfy himself that the boiler is safe in construction and can be used without constituting a danger. The boiler should be fitted in accordance with the manufacturer's instructions. If these instructions are not available, the installer should seek advice from the manufacturer before fitting the boiler.

A boiler conforming to BS 5258-1 or BS 5258-8 may be considered safe to install.

For all boilers

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

The installer should check the data provided with the boiler to confirm that the boiler 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.

4.2.2 Boilers for sealed systems

Boilers intended to be used in a sealed system shall be selected from those specifically designated for this purpose by the manufacturer, or shall be modified by means of a kit supplied for this purpose by the manufacturer and certified during the CE approval procedure.

COMMENTARY AND RECOMMENDATIONS ON 4.2.2

Boilers used in sealed systems should incorporate appropriate protection devices.

Boilers conforming to BS EN 297 or BS EN 483 are not suitable for sealed systems. Such boilers will be identified in their installation instructions as suitable only for use with an open system.

[A1]

4.3 Condensing boilers**4.3.1 General**

Boilers 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, the requirements in 4.3.2, 4.3.3, 4.3.4 and 4.3.5 shall be followed.

NOTE Attention is drawn to the Building Regulations for England and Wales, Part L1, which require that gas-fired boilers installed after 1 April 2005 are to be condensing boilers, whether they are replacements or new installations, with a few exceptions. The *Guide to the Condensing Boiler Installation Assessment Procedure for Dwellings* [8a], issued by the Office of the Deputy Prime Minister, provides guidance on these exceptions.

COMMENTARY AND RECOMMENDATIONS ON 4.3.1

The manufacturer's installation instructions should describe any particular requirements for the condensing boiler, e.g. a means for disposal of condensate, and the water temperature operating range.

4.3.2 The siting of the flue terminal

Where the plume from a flue terminal may cause a nuisance an extended vertical flue or high-level termination shall be considered. Reference shall be made to the boiler manufacturer's instructions, in case they contain special advice. In particular, the potential for the plume to cross the following situations shall be avoided:

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

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

COMMENTARY AND RECOMMENDATIONS ON 4.3.2

Condensing boilers will produce a visible plume of water vapour for a significant proportion of their operating time. At low level, this plume may cause nuisance.

Other aspects to consider when planning the flue terminal position include:

- *the need for a free passage of air to aid plume dispersal;*
- *in cold weather, the plume could cause a safety hazard if it freezes on pathways, or if it results in frost damage to surfaces;*
- *the plume could trigger infra-red security lighting if sited in the wrong place;*
- *the plume could affect the performance of external temperature sensors associated with energy management control systems;*
- *ensure flue terminals or plume do not obscure security camera field of vision;*
- *the flue terminal guards should be able to resist corrosive properties of the condensate.*

Further information on flue terminal siting for safety reasons is provided in BS 5440-1. For guidance on how to reduce the possibility of nuisance to neighbouring buildings, refer to the section on flue terminal siting in the Guide to the Condensing Boiler Installation Assessment Procedure for Dwellings [8a], issued by the Office of the Deputy Prime Minister.

4.3.3 The choice of condensate drainage pipe

The condensate drainage pipe shall be run in a standard drainpipe material, e.g. poly(vinyl chloride) (PVC), unplasticized poly(vinyl chloride) (PVC-U), acrylonitrilebutadiene-styrene (ABS), polypropylene (PP) or chlorinated poly(vinyl chloride) (PVC-C).

Pipework shall be compatible with the condensate drain connection on the boiler. The connection shall have a nominal diameter of not less than 22 mm to promote the clearance of condensate.

For externally run condensate drainage pipe, extra care is necessary in order to reduce the risk of the condensate drainage pipe becoming blocked due to the condensate freezing. The length of condensate drainage pipe external to the dwelling shall be kept as short as possible and not more than 3 m, unless it is insulated.

Any trap in the condensate drainage pipe shall be fitted within the dwelling.

Many boilers have a siphon fitted as part of the condensate trap arrangement. This will significantly reduce the risk of condensate freezing where part of the condensate drainage pipe is run externally.

If a boiler does not include a siphon then any external condensate drainage pipe shall be increased to a minimum of 32 mm nominal diameter to reduce the risk of freezing. In exposed locations, the condensate drainage pipe shall be protected with waterproof pipe insulation.

COMMENTARY AND RECOMMENDATIONS ON 4.3.3

When a boiler is to be installed in an unheated location such as a garage, all condensate drainage pipes should be considered as external.

4.3.4 The positioning and termination of the condensate drainage pipe

Condensate drainage pipe shall be positioned and terminated such that it discharges the condensate safely away from the building.

All condensate drainage pipes and connecting pipework operating under gravity shall have a fall of at least 2.5° to the horizontal or approximately 45 mm per metre of condensate drainage pipe run. The number of bends and fittings shall be kept to a minimum in order to reduce the risk of condensate being trapped.

NOTE Where condensate cannot be removed under gravity, see 4.3.5 for guidance on condensate removal pumps.

Suitable condensate discharge arrangements are by connection to:

- a) a soil and vent stack (internal or external);
- b) an internal waste pipe;
- c) an external drain or gully;
- d) a rainwater hopper that is part of a combined system, i.e. a sewer that carries both rainwater and foul water;
- e) a purpose-made soakaway.