

Specification for

**Installation of gas-fired
hot water boilers of
rated inputs
between 60 kW
and 2 MW (2nd and 3rd
family gases)**

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Gas Standards Policy Committee (GSE/-) to Technical Committee GSE/30, upon which the following bodies were represented:

- British Flue and Chimney Manufacturers' Association
- British Gas plc
- Confederation for the Registration of Gas Installers
- Consumer Policy Committee of BSI
- Department of the Environment (PSA)
- Department of Trade and Industry (Consumer Safety Unit, CA Division)
- Health and Safety Executive
- Institute of Domestic Heating and Environmental Engineers
- Institution of Gas Engineers
- Liquefied Petroleum Gas Industry Technical Association (UK)
- Society of British Gas Industries
- Trades Union Congress

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- British Combustion Equipment Manufacturers' Association
- Chartered Institution of Building Services Engineers
- Fire Officers' Committee
- Water Research Centre

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Foreword

This British Standard has been prepared under the direction of the Gas Standards Policy Committee. It supersedes BS 6644:1990 which is withdrawn.

This edition introduces technical changes to bring the standard up to date but it does not reflect a full review of the standard, which will be undertaken in due course. It includes technical changes to clauses **2, 3, 9, 10, 11, 12, 14, 16, 19, 20, 21, 25**, Table 1 and Table 3 and Figure 1.

NOTE This standard has been written in the form of a practice specification (see clause **6** of PD 6501-1:1982). To comply with this specification, the user has to comply with all of its requirements. He may depart from recommendations, but this will be on his own responsibility and he will be expected to have good reasons for doing so.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with this British Standard does not of itself confer immunity from relevant legal obligations. In particular, attention is drawn to the Gas Safety (Installation and Use) Regulations and the Building Regulations of England and Wales, of Scotland and of Inner London.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 20, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Section 1. General

1 Scope

This British Standard specifies the installation requirements for gas-fired hot water boilers of rated heat inputs between 60 kW and 2 MW.

Groups of boilers with individual ratings of 60 kW or less, but with aggregate inputs greater than 60 kW, are covered by this standard.

The requirements of this standard apply to installations supplied with 2nd family gases, e.g. natural gas, including mixtures of liquefied petroleum gas (LPG) and air, and 3rd family gases (LPG).

This standard specifies requirements for the boiler installation only, not for the design and installation of any associated heating or hot water supply system.

NOTE The titles of the publications referred to in this standard are listed on page 19.

2 Definitions

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

2.1

automatic natural draught burner

a natural draught burner in which, starting from the completely shut-down condition, the start-gas flame is established and the main gas valve(s) actuated by the control without manual intervention

NOTE Automatic burners may have pilots which are either interrupted or intermittent.

2.2

non-automatic natural draught burner

a natural draught burner with a permanent pilot ignited under manual supervision

2.3

bank of boilers

a group of two or more boilers connected to common flow and return pipes, in which the individual boilers cannot be separately isolated

2.4

condensing boiler

an appliance in which condensation of a part of the water vapour in the combustion products is designed to occur within the appliance under equilibrium conditions, in order to make use of the latent heat in the water vapour

2.5

design pressure

the pressure used in the design calculations and also the maximum permissible setting of any safety valve fitted on, or adjacent to, the boiler

2.6

modular system

a system consisting of an assembly of two or more generally identical heating appliances (or modules) sharing the same heating load

2.7

operating pressure

the maximum pressure measured in the boiler under normal operating conditions

NOTE The pressure will be dependent on the static head, the pressurizing equipment (where fitted) and the effect of a circulating pump. The static head, and pressurizing equipment in the case of pressurized systems, determines the maximum water temperature permissible at the point of lowest pressure, which should not exceed a predetermined level below the saturated steam temperature for that lowest pressure.

2.8

overheat cut-off device

a non-adjustable temperature actuated device designed to protect an appliance and its surroundings in the event of failure of the normal means of temperature control

2.9

safety valve

a spring-loaded automatic valve fitted on, or adjacent to, a boiler for relieving the build-up of excess pressure by means of discharge to atmosphere

2.10

derated coefficient of discharge K_{dr}

the coefficient of discharge multiplied by 0.9, i.e. $K_{dr} = K_d \times 0.9$

Section 2. Selection and installation of boiler

3 Selection of boiler

3.1 Boilers, supplied as a complete package with the burner and all other necessary controls and equipment, shall comply with either BS 5978-1 and BS 5978-2 or BS 5978-1 and BS 5978-3. All materials and components shall comply with the following standards.

BS 21, *Specification for pipe threads for tubes and fittings where pressure-tight joints are made on the threads (metric dimensions).*

BS 41, *Specification for cast iron spigot and socket flue or smoke pipes and fittings.*

BS 143, BS 1256, *Specification for malleable cast iron and cast copper alloy threaded pipe fittings.*

BS 715, *Specification for metal flue pipes, fittings, terminals and accessories for gas fired appliances with a rated input not exceeding 60 kW.*

BS 759, *Valves, gauges and other safety fittings for application to boilers and to piping installations for and in connection with boilers —*

Part 1: Specification for valves, mounting and fittings.

BS 835, *Specification for asbestos-cement flue pipes and fittings, heavy quality.*

BS 864, *Capillary and compression tube fittings of copper and copper alloy.*

BS 1181, *Specification for clay flue linings and flue terminals*

BS 1363, *Specification for 13 A fused plugs and switched and unswitched socket-outlets.*

BS 1387, *Specification for screwed and socketed steel tubes and tubulars and for plain end steel tubes suitable for welding or for screwing to BS 21 pipe threads.*

BS 1552, *Specification for manual shut-off valves for use with 1st, 2nd and 3rd family gases.*

BS 2871, *Specification for copper and copper alloys. Tubes — Part 1: Copper tubes for water, gas and sanitation — Part 2: Tubes for general purposes — Part 3: Tubes for heat exchangers.*

BS 3016, *Specification for pressure regulators and automatic changeover devices for liquefied petroleum gases.*

BS 3554, *Specification for gas governors — Part 2: Independent governors for inlet pressures up to 350 mbar.*

BS 4076, *Specification for steel chimneys.*

BS 4504, *Circular flanges for pipes, valves and fittings (PN designated).*

BS 5292, *Specification for jointing materials and compounds for installations using water, low pressure steam or 1st, 2nd and 3rd family gases.*

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

BS 5885, *Automatic gas burners — Part 1: Specification for burners with input rating 60 kW and above — Part 2: Specification for packaged burners with input rating 7.5 kW up to but excluding 60 kW.*

BS 6448, *Gas governors — Part 1: Specification for pressure governors with nominal connection size up to 50 mm for gas appliances with inlet pressures up to and including 200 mbar.*

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

COMMENTARY AND RECOMMENDATIONS ON 3.1.

Appendix A lists items that should be considered before installation commences and the official bodies that should be consulted.

3.2 Where the boiler shell and its associated forced or induced draught burner are supplied independently and assembled on site the boiler shell shall comply with the requirements of BS 779, BS 855 or BS 2790 as appropriate and the burner assembly shall comply with the requirements of BS 5885.

3.3 Any individual boiler of rated heat input not exceeding 60 kW installed as part of a group of boilers (modular system (see 2.6)) shall incorporate an overheat cut-off device (see 2.8) and shall comply with BS 5258-1.

3.4 Boilers shall be installed in accordance with the manufacturer's instructions and the requirements of this standard.

4 Boiler siting

4.1 The manufacturer's instructions and associated data sheets shall be consulted on the siting of boilers.

4.2 Purpose-constructed boiler rooms shall comply with the requirements of clause 5.

COMMENTARY AND RECOMMENDATIONS ON 4.2. *It is desirable that consideration always be given to the installation of boilers in purpose-constructed boiler rooms.*

4.3 Where a suitably constructed boiler room is not available, measures shall be taken to protect the boiler from damage.

The boiler shall be sited so that extraneous material cannot be stored next to the boiler.

COMMENTARY AND RECOMMENDATIONS ON 4.3. *A protective rigid cage around the boiler is recommended in such circumstances.*

4.4 Air for combustion and ventilation shall be provided in accordance with clause 19.

4.5 In accordance with the manufacturer's instructions, space shall be allowed and means shall be provided to give ready access for installing, operating, servicing and replacing the burner(s), controls, flueways, waterways and any other parts that require regular attention.

COMMENTARY AND RECOMMENDATIONS ON 4.5.
Consideration should be given to the provision of adequate means of access to permit replacement of the boiler. This is particularly important in the case of roof-top and basement installations.

4.6 Provision shall be made for the effective discharge of the products of combustion to the outside air (see clause 20).

4.7 Clearance between the boiler and its flue and any combustible material shall comply with the requirements of 4.1 and 20.9, as appropriate.

4.8 Measures shall be taken to ensure that the temperatures in rooms and internal spaces adjacent to the boiler installation remain compatible during operation of the boiler with their intended uses.

4.9 Floors and walls on which boilers are to be sited shall be capable of withstanding temperatures of at least 65 °C and shall be capable of supporting the boiler(s) when filled with water (see clause 6).

4.10 Operating noise levels shall be kept to a minimum.

COMMENTARY AND RECOMMENDATIONS ON 4.10.
Guideline on acceptable noise levels is given in the document "Code of practice for reducing the exposure of employed persons to noise", published by the Department of Employment, and the CIBSE Guide. Specialist consultancy advice may be necessary.

4.11 Means shall be provided for the disposal of water when the system is drained. Such means shall be readily accessible.

4.12 Boilers sited at or below ground level and in low-lying areas shall have protection from the effects of flooding.

Boilers fired by 3rd family gases shall not be installed below ground level, e.g. in cellars or basements.

4.13 For boilers installed on roof-tops or intermediate floors or a multi-storey building, precautions shall be taken to protect the building and the boiler house against the effects of any water leakage from the boiler installation.

5 Boiler rooms

5.1 Boiler rooms shall be constructed, or shall be adapted, to meet the requirements of 5.2 to 5.8.

5.2 There shall be easy access to boiler rooms at all times.

COMMENTARY AND RECOMMENDATIONS ON 5.2. *Access to boiler installations should preferably be from outside the building.*

5.3 Where boilers are operated on 3rd family gases, the boiler room shall not have any openings to an immediately adjacent part of the building which is below ground level.

5.4 Any means of access to the boiler room shall open in the direction of the escape route.

5.5 Any means of access to the boiler room shall be readily openable from inside the room without the aid of a key.

5.6 The distance from any point within the boiler room to the nearest means of access shall not exceed 12 m (see BS 5588-1).

5.7 The boiler room shall be well lit by permanent electric lighting.

5.8 Boiler rooms for housing boilers fired by 3rd family gases shall not be situated below ground level.

6 Boiler bases

If a specially prepared boiler base is required, it shall be in accordance with the manufacturer's instructions with the objective of preventing the floor of the building reaching a temperature greater than 65 °C at any time when the boiler is functioning normally.

COMMENTARY AND RECOMMENDATIONS ON CLAUSE 6.
The design of the base requires consideration in relation to the heat losses, the number of boilers, their distance apart, their hearth areas and shapes.

7 Boilers converted to gas firing

Installation safety standards equivalent to those for a purpose designed gas-fired boiler shall be applied to installations of other fuel-fired boilers that are converted to gas firing.

COMMENTARY AND RECOMMENDATIONS ON CLAUSE 7.
Guidance is given in IM/10: "Technical Notes on changeover of gas of central heating and hot water boilers for non-domestic applications", published by British Gas plc. The gas undertaking or supplier should be consulted at the planning stage.

8 Multiple boiler installations

8.1 Every boiler connected in parallel to common flow and return manifolds to form a multiple installation shall be capable of isolation from the water, gas and electricity supplies.

8.2 In the case of modular boiler installations isolating valves shall be fitted on the common flow and return pipes of each bank of boilers (see **2.3**).

COMMENTARY AND RECOMMENDATIONS ON **8.2**.

Individual boilers in modular boiler installations need not be provided with water isolating valves.

9 Safety valves

9.1 Single boiler installations

9.1.1 General

9.1.1.1 Every boiler shall be provided with a safety valve(s) complying with BS 6759-1, and set to lift at a pressure not exceeding the boiler design pressure (see **2.5**).

COMMENTARY AND RECOMMENDATIONS ON **9.1.1.1**. *An additional safety valve should be fitted to the secondary heat exchanger of a condensing boiler, when it is connected to a heating circuit separate from the primary heat exchanger. The manufacturer's installation instructions should be consulted.*

9.1.1.2 The safety valve(s) shall be either:

- a) attached directly to the boiler; or
- b) fitted to the shortest possible straight length of pipe rising vertically from the boiler.

9.1.1.3 Where the safety valve(s) is not fitted directly to the boiler, the pipe on which the valve(s) is mounted shall have an internal diameter not less than the bore of the valve, or an internal cross-sectional area not less than the aggregate area of all the valves mounted upon it.

No other valve or cock shall be fitted between the safety valve(s) and the boiler, nor shall the pipe be used for any other purpose.

COMMENTARY AND RECOMMENDATIONS ON **9.1.1.2** AND **9.1.1.3**. *Direct fitment of the safety valve(s) to the boiler is preferred wherever possible.*

9.1.2 Sizing of safety valves

9.1.2.1 The size of the safety valve bore shall be not less than 19 mm.

9.1.2.2 For boilers installed on open vented hot water systems, the size of safety valves shall be not less than those given in Table 1 or shall be determined using equation 1.

Table 1 — Safety valve sizes (open vented systems only)

Rated output	Nominal size	Minimum area (A)
kW	mm	mm ²
45 to 264	19	284
265 to 352	25	491
353 to 440	32	802
441 to 528	40	1135
529 to 732	50	2050
733 to 1142	65	3210
1143 to 1640	80	4540

$$R = 0.658 p A K_{dr} \quad (1)$$

where

- R is the boiler output rating (in kW);
- p is the maximum absolute relieving pressure (in bar¹⁾), i.e. (boiler design pressure $\times 1.1$) + 1;
- A is the flow area (in mm²);
- K_{dr} is the derated coefficient of discharge (see **2.10**).

9.1.2.3 For boilers installed on unvented hot water systems the size of safety valve(s) shall be determined using equation 2.

$$R = 0.329 p A K_{dr} \quad (2)$$

where

- R , p , A and K_{dr} have the same meanings as in **9.1.2.2**.

9.1.3 Setting of safety valves

9.1.3.1 The setting of safety valves shall be determined using the following equation.

Valve setting (in bar) = 0.7 + boiler operating pressure (in bar).

9.1.3.2 Where the boiler is connected to a hot water system not capable of withstanding the boiler design pressure, provision shall be made to protect the system at its own permissible working pressure.

COMMENTARY AND RECOMMENDATIONS ON **9.1.3.2**. *The safety valve is fitted to protect the boiler and full discharge will only be achieved at the maximum design pressure of the boiler.*

9.1.4 Discharge from safety valve

9.1.4.1 The discharge pipe from the safety valve shall be self-draining and shall terminate in a visible position where discharge will not result in hazard to user or plant.

¹⁾ 1 bar = 10⁵ N/m² = 100 kPa.