

BS 6644:2011

Incorporating Corrigendum No. 1



BSI Standards Publication

Specification for the installation and maintenance of gas-fired hot water boilers of rated inputs between 70 kW (net) and 1.8 MW (net) (2nd and 3rd family gases)

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Foreword

Publishing information

This British Standard is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 30 November 2011. It was prepared by 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.

Supersession

This British Standard supersedes BS 6644:2005+A1:2008, which is withdrawn.

Information about this document

This is a full revision of the standard and introduces the following principal changes:

- system requirements in accordance with BS EN 12828 have been added;
- details on condensing appliances and condensate removal have been added;
- the appliance classification types have been updated.

NOTE The general installation requirements contained within this standard may also be applied to gas installations supplied with LPG/air mixtures, e.g. that are used on the Channel Islands (see the Gas Safety (Installation and Use) Regulations 1994 [1] and the Health and Safety (Gas) (Guernsey) Ordinance 2006 [2]). However, particular attention needs to be given to ensure that any gas equipment being installed has been appropriately converted and is suitable for the gas being supplied.

Use of this document

The start and finish of text introduced or altered by Corrigendum No. 1 is indicated in the text by tags C1 C1.

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 are responsible for its correct application.

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

In particular, attention is drawn to the following regulations, which might be amended from time to time. The commentary in this British Standard reflects the state of the regulations in 2011.

The Gas Safety (Installation and Use) Regulations 1994, as amended and applied by the Gas Safety (Application) Order (Isle of Man) 1996 [1]

The Health and Safety (Gas) (Guernsey) Ordinance 2006 [2]

The Gas Safety (Installation and Use) Regulations 1998 [3]

The Gas Safety (Installation and Use) (Northern Ireland) Regulations 2004 [4]

The Gas Appliances (Safety) Regulations 1995 [5]

The Boiler (Efficiency) Regulations 1993, as amended [6]
The Building Regulations 2000, as amended [7]
The Building (Scotland) Regulations 2004 [8]
The Building Regulations (Northern Ireland) Statutory Rules 2000 [9]
The Pressure Equipment Regulations 1999 [10]
The Water Supply (Water fittings) Regulations 1999 [11]
The Health and Safety at Work etc. Act 1974 [12]
The Electricity at Work Regulations 1989 [13]
Clean Air Act 1993 [14]
The Asbestos (Prohibitions) Regulations 1992, as amended [15]
The Dangerous Substances and Explosive Atmospheres Regulations 2002 [16]
The Environment Act 1995 [17]

1 Scope

This British Standard specifies requirements for the installation, including design, inspection, commissioning and maintenance, of gas-fired hot water boilers of net rated heat inputs exceeding 70 kW but not exceeding a net heat input of 1.8 MW. Groups of boilers with individual net heat inputs of 70 kW or less, but with aggregate net heat inputs in excess of 70 kW, are also covered.

This British Standard is applicable to the installation of boilers that are designed to utilize normally distributed gases of Group H of the second family (e.g. natural gas), and gases of Group P (e.g. propane) and Group B (e.g. butane) of the third family. For the purposes of this installation standard, LPG/air mixtures are regarded as third family gases.

This British Standard is applicable to the installation of the following gas-fired hot water boilers:

- a) boilers supplied as a complete assembly and conforming to BS EN 656 or BS 5978 (all parts);
- b) boilers supplied as a complete assembly and used in multiple boiler installations where the total net heat input exceeds 70 kW and conforming to BS EN 297, BS EN 483 or BS EN 677;
- c) boilers and burners delivered separately and assembled on site, comprising:
 - 1) a boiler shell conforming to BS EN 303-1, BS EN 12952 (all parts), BS EN 12953 (all parts), BS 779, BS 855 or BS 2790;
 - 2) a burner conforming to BS EN 676;
 - 3) an assembly conforming to BS EN 303-3 or BS 5978-1 and BS 5978-3.

NOTE 1 It is recognized that the design, inspection and commissioning require different levels of competence (see 4.1 and 4.2). Where all of these tasks are performed by same person, that person has to have the necessary levels of competence for each task.

NOTE 2 Although this British Standard does not contain any requirements for industrial processes, the general principles can be applied.

NOTE 3 The general principles of this British Standard with respect to hot water circuits can be used for boilers exceeding 1.8 MW net heat input (2 MW gross heat input). For installations exceeding 1.8 MW net heat input see IGEMI/UP/10 [18].

NOTE 4 The ratio of gross to net heat input is approximately 1.11:1 for Group H (natural gas), 1.09:1 for Group P (propane) and 1.08:1 for Group B (butane).

It is also applicable to installations that have been converted from burning other fuels to gas-firing.

This British Standard is not applicable to:

- i) the installation of any heating or hot water supply system associated with the boiler installation;
- ii) the installation of gas cushion systems (non diaphragm expansion vessels) intended to pressurize the hot water circuit; or
- iii) installations in hazardous areas, as defined in The Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) 2002 [16], other than those classified as Zone 2 NE, guidance on which is given in IGEM/SR/25 [19] and IGEM/UP/16 [20].

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 779, *Specification for cast iron boilers for central heating and indirect hot water supply (rated output 44 kW and above)* ¹⁾

BS 855, *Specification for welded steel boilers for central heating and indirect hot water supply (rated output 44 kW to 3 MW)*

BS 1212-1, *Float operated valves – Part 1: Specification for piston type float operated valves (copper alloy body) (excluding floats)*

BS 1212-2, *Float operated valves – Part 2: Specification for diaphragm type float operated valves (copper alloy body) (excluding float)*

BS 1212-3, *Float operated valves – Part 3: Specification for diaphragm type float operated valves (plastic bodied) for cold water services only (excluding floats)*

BS 2790, *Specification for design and manufacture of shell boilers of welded construction* ²⁾

BS 5440-2:2009, *Flueing and ventilation for gas appliances of rated input not exceeding 70 kW net (1st, 2nd and 3rd family gases) – Part 2: Specification for the installation and maintenance of ventilation provision for gas appliances*

BS 5854:1980, *Code of practice for flues and flue structures in buildings*

BS 5978 (all parts), *Safety and performance of gas-fired hot water boilers (60 kW to 2 MW input)*

BS 7671, *Requirements for electrical installations – IET Wiring Regulations (Seventeenth edition)*

BS EN 297, *Gas-fired central heating boilers – Type B₁₁ and B_{11BS} boilers fitted with atmospheric burners of nominal heat input not exceeding 70 kW*

BS EN 303-1, *Heating boilers – Part 1: Heating boilers with forced draught burners – Terminology, general requirements, testing and marking*

BS EN 303-3, *Heating boilers – Part 3: Gas-fired central heating boilers – Assembly comprising a boiler body and a forced draught burner*

BS EN 483, *Gas-fired central heating boilers – Type C boilers of nominal heat input not exceeding 70 kW*

BS EN 656:2000, *Gas-fired central heating boilers – Type B boilers of nominal heat input exceeding 70 kW but not exceeding 300 kW*

BS EN 676, *Automatic forced draught burners for gaseous fuels*

BS EN 677, *Gas-fired central heating boilers – Specific requirements for condensing boilers with a nominal heat input not exceeding 70 kW*

BS EN 1443:1999, *Chimneys – General requirements*

BS EN 1856-1, *Chimneys – Requirements for metal chimneys – Part 1: System chimney products*

BS EN 1856-2, *Chimneys – Requirements for metal chimneys – Part 2: Metal liners and connecting flue pipes*

¹⁾ BS 779 has been partially superseded by BS EN 303-1 and BS EN 303-4.

²⁾ BS 2790 has been partially superseded by BS EN 12953-1, BS EN 12953-2, BS EN 12953-5, BS EN 12953-6 and BS EN 12953-8.

BS EN 1993-3-2, *Eurocode 3 – Design of steel structures – Part 3-2: Towers, masts and chimneys – Chimneys*

BS EN 12952 (all parts), *Water-tube boilers and auxiliary installation*

BS EN 12953 (all parts), *Shell boilers*

BS EN 13076, *Devices to prevent pollution by backflow of potable water – Unrestricted air gap – Family A, type A*

BS EN 13077, *Devices to prevent pollution by backflow of potable water – Air gap with non-circular overflow (unrestricted) – Family A, type B*

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

BS EN 13959, *Anti-pollution check valves – DN 6 to DN 250 inclusive Family E, type A, B, C and D*

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

BS EN ISO 10380:2003, *Pipework – Corrugated metal hoses and hose assemblies*

[N1] INSTITUTION OF GAS ENGINEERS AND MANAGERS. *Gas installation pipework, boosters and compressors on industrial and commercial premises*. IGEM/UP/2. London: 1994. ISBN 0717700577.

[N2] UKLPG. Code of Practice 24: Part 6 – The Use of Propane in Cylinders at Commercial and Industrial Premises. May 2000.

[N3] UKLPG. Code of Practice 22: LPG piping systems: design and installation. 2002.

3 Terms and definitions

For the purposes of this British Standard, the definitions given in BS EN 297, BS EN 483, BS EN 656, BS EN 677, BS EN 303-1, BS EN 303-3, BS EN 12952 (all parts), BS EN 12953-1, BS 5978 (all parts) and the following apply.

3.1 automatic natural draught burner

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 can have pilots that are either interrupted or intermittent.

3.2 bank of boilers

group of two or more boilers connected to common flow and return pipes

3.3 boiler house

dedicated building for the installation of boilers and ancillary boiler plant

3.4 boiler room

dedicated room within a building for the installation of boilers and ancillary boiler plant

3.5 balanced compartment

boiler house/room or enclosure for one or more gas appliances, specifically designed to draw its combustion air from a point adjacent to the point at which the products of combustion are discharged, the inlet and outlet being so disposed that wind effects are substantially balanced

3.6 condensing boiler

boiler in which, under normal operating conditions, the water vapour in the combustion products is totally or partially condensed in order to make use of the latent heat in the water vapour for heating purposes

3.7 coefficient of discharge, K_d

value of actual flowing capacity (from tests) divided by the theoretical flowing capacity (from calculations)

3.8 derated coefficient of discharge, K_{dr}

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

3.9 enclosure

space in which a boiler(s) is installed, which is not large enough to permit access for work other than maintenance via external access

3.10 free-area

unobstructed cross-sectional area of a grille, louvre or duct calculated as the sum of the cross-sectional areas of all unobstructed apertures measured through the plane of minimum area and at right angles to the airflow within the apertures

3.11 grille

non-closable fitment for an opening through which air passes

3.12 maximum allowable temperature (system)

maximum temperature at which the system or parts of the system are designed to operate

3.13 maximum allowable temperature (boiler)

the temperature at which the safety temperature limiter causes the boiler to go to non-volatile lockout

NOTE This definition has been adapted from that given in the Pressure Equipment Regulations 1999 [10].

3.14 maximum allowable pressure (water)

maximum pressure at which the boiler or parts of the boiler system is designed to operate, as specified by the manufacturer

NOTE The lowest maximum allowable pressure of any component of the system determines the maximum allowable pressure of the system itself.

3.15 modular boiler

boiler consisting of two or more generally identical modules, each of which consists of a heat exchanger, burner and control and safety devices

NOTE The assembly has a single flue outlet, a common gas connection, a common electricity supply connection and common flow and return water connections. Each module is capable of independent operation (see BS EN 656:2000, 3.2.4).

3.16 modular system

system consisting of an assembly of two or more generally identical boilers sharing the same heating load

3.17 operating pressure

maximum pressure under normal operating conditions

3.18 plant room

room in a building which houses plant or machinery

3.19 safety temperature limiter

device that causes safety shut down and non-volatile lockout so as to prevent the water temperature exceeding a pre-set limit

NOTE The maximum "pre-set" limit is the "maximum allowable temperature".

3.20 safety valve

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

3.21 Type B (open flue boiler)

boiler designed to be connected to a flue system that evacuates the products of combustion to the outside air and which draws combustion air directly from the room or enclosure containing the boiler

NOTE See PD CEN/TR 1749.

3.22 Type C (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 the open air outside the premises and vents the products of combustion directly to open air outside the premises

NOTE See PD CEN/TR 1749.

4 Competence and design considerations

4.1 Non-gas 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 4.1

Competence requires sufficient knowledge, practical skill and experience to carry out the job in hand safely, with due regard to good working practice. Any 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.

4.2 Gas competence

Persons carrying out any gas installation, commissioning, servicing and/or maintenance work shall be competent to do so.

COMMENTARY AND RECOMMENDATIONS ON 4.2

It is a statutory requirement that all gas work 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 to operate and maintain such a register.

The statutory regulations, registration bodies and approval bodies applicable to Great Britain, the Isle of Man, Northern Ireland and Guernsey are given in Table 1.

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

Table 1 Registration and approval bodies by country/territory

Country/ territory	Gas registration body	Approval body	Statutory regulations
Great Britain	Gas Safe Register	Health and Safety Executive (HSE)	Gas Safety (Installation and Use) Regulations 1998 [3]
Isle of Man	Gas Safe Register	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 [1]
Northern Ireland	Gas Safe Register	Health and Safety Executive Northern Ireland (HSENI)	Gas Safety (Installation and Use) (Northern Ireland) Regulations 2004 [4]
Guernsey	Gas Safe Register	Health and Safety Executive for the States of Guernsey [HSE (Guernsey)]	Health and Safety (Gas) (Guernsey) Ordinance 2006 [2]

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)} Health and Safety Commission's Approved Code of Practice (ACoP) (COP 20) "Standards of training in safe gas installation" [21].

At the time of publication, the body with HSE approval to operate and maintain a register of businesses who are a "member of a class of persons" is the Gas Safe Register.

Persons deemed competent to carry out gas work are those who hold a certificate of gas safety competence acceptable to the Gas Safe Register which includes (without limitation) the National Accredited Certification Scheme for Individual Gas Fitting Operatives' (ACS) and the Gas Services SINVQ that has been aligned with ACS. However, some ACoP certification for industrial installations might continue for some time.

4.3 Design considerations

The design shall be such that it permits installation to proceed in accordance with the boiler manufacturer's instructions. In case of doubt, the designer shall consult the boiler manufacturer.

The following shall be ascertained before detailed planning of the installation begins:

- the type of building in which the boiler is to be installed, its form of construction and its suitability for the particular boiler installation, perhaps by application of risk assessment procedures;
- the sizes and purposes of rooms and working areas;

- c) the size, height and route of the flue and the position of the termination, including the possible consequences of any plumbing, together with the materials of construction;
NOTE Guidance on chimney and flue design is given in Annex F and in IGEN/UP/10, Appendix 3 [18].
- d) the availability of adequate air for combustion and ventilation;
- e) heat losses and heat gains;
- f) gas pressures and the availability of supplies;
- g) the feasibility of providing a gas supply where a gas supply does not already exist;
- h) the available electrical supplies;
- i) the applicable legislation and any local bye-laws;
- j) the location and routing of any drains for the removal of condensate (see 6.10.2);
- k) transmission of noise and vibration (guidance on acceptable noise levels is given in CIBSE Guide B [22] and the HSE's "Code of practice for reducing the exposure of employed persons to noise" [23] – specialist consultancy advice might be necessary);
- l) whether the hot water system's location is classified as a hazardous area, as defined in DSEAR 2002 [16];
- m) provision for water treatment (see 6.3).

COMMENTARY AND RECOMMENDATIONS ON 4.3

Collaboration is essential between those concerned with the design of the hot water boiler and its installation, both at the planning stage and during the execution of the work.

The designer should draw the attention of the owner or occupier of the premises, in which the hot water boiler is to be installed, to their responsibility for ensuring that:

- a) *the local authority is consulted about building regulations and planning application requirements, including the approval of the chimney height if the net input of the boiler(s) exceeds 330 kW (366.4 kW gross) for 2nd family gases or 338 kW (366.4 kW gross) for 3rd family gases and the impact of all emissions on local air quality;*
- b) *the fire authority and/or the enforcing authority under the Health and Safety at Work etc. Act 1974 [12], as appropriate, is consulted in respect of fire precautions;*
- c) *the fire insurers are notified of any proposed changes in the means of heating;*
- d) *the responsible gas conveyor is advised of the proposed installation of any gas booster or compressor which is either part of the boiler or an addition to it;*
- e) *the gas conveyor is consulted to ensure that the gas service is suitable to supply all of the gas to the complete installation at the correct pressure, including any existing load.*

5 Selection of boiler, materials and components

5.1 General

The installer shall check that any new boiler is CE marked, where appropriate.

Any individual boiler of rated net heat input not exceeding 70 kW selected for installation as part of a modular system of boilers exceeding a net heat input of 70 kW shall incorporate a safety temperature limiter.

The installer shall check the data provided with the boiler to confirm that the boiler is appropriate for the installation, and shall confirm the basis on which the nominal heat input, or heat input rating, is quoted, i.e. gross or net (see Clause 1, Note 4).

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 installer shall only select external control devices of a type recommended by the boiler manufacturer. In case of doubt, the boiler manufacturer shall be consulted.

COMMENTARY AND RECOMMENDATIONS ON 5.1

The HSE publication: "Safety in the installation and use of gas systems and appliances" [24] should be consulted.

Of the boilers covered by this standard, new boilers with a normal operating temperature not exceeding 105 °C fall within the scope of the European Gas Appliances Directive [25], implemented in the UK by the Gas Appliances (Safety) Regulations 1995 [5]. Those with a heat output not exceeding 400 kW are also covered by the Boiler (Efficiency) Regulations 1993 [6].

New boilers with a maximum allowable temperature exceeding 110 °C are required to be CE marked in accordance with the Pressure Equipment Directive [26], implemented in the UK by the Pressure Equipment Regulations 1999 [10]. Boilers with a maximum operating temperature exceeding 105 °C, but a maximum allowable temperature not exceeding 110 °C, are subject, at least, to sound engineering practice in accordance with the Pressure Equipment Directive [26].

5.2 Condensing boilers

A condensing boiler shall be installed in accordance with the manufacturer's instructions, paying particular attention to any instructions concerning the management of condensate, which can have implications for the siting of the boiler and/or its flue terminal.

Due to the tendency of condensing boilers to form a plume of water vapour from the flue terminal, the terminal shall be sited such that the wet combustion products do not cause damage or nuisance.

COMMENTARY AND RECOMMENDATIONS ON 5.2

The manufacturer's instructions should be consulted for any particular requirements for the condensing boiler, e.g. a means for the disposal of condensate.

When siting a condensing boiler, early consideration should be given to the following.

- a) *The effect of wind conditions and the dispersal of the plume relative to adjacent wall surfaces, openable windows and neighbouring buildings might require greater separation distances to prevent nuisance and ingress.*

b) *The positioning and termination of the condensate drain pipe.*

The condensate pipe should, ideally, run and terminate internally to a soil and vent stack or a waste pipe. Alternatively, the condensate may be discharged into the rainwater system or a purpose-made soakaway.

All connecting drainage pipework should have a fall of at least 2.5° to the horizontal, or approximately 50 mm per metre of pipe run. If the drainage pipe has an external run the pipe should be insulated against frost. It should be noted that the connection of a condensate pipe to a drain might be subject to building controls.

Waste discharges might need approval from the local Waste Management or Water Authority.

In certain instances a condensate neutraliser might be required.

c) *The choice of condensate drainage pipe.*

The condensate drainage pipe should be run in a standard drain pipe material, e.g. polyvinyl chloride (PVC), unplasticized polyvinyl chloride (PVC-U), acrylonitrile-butadiene-styrene (ABS), polypropylene polypropene (PP) or cross-linked polyvinyl chloride (PVC-C). Any internal pipework should be of a diameter specified in the boiler manufacturer's instructions. Any external pipework should be kept to a minimum length with a minimum diameter of 22 mm, which might be greater than that recommended by the manufacturer in order to minimize the effects of freezing.

5.3 Materials and components

Materials and components containing asbestos shall not be selected for use in the installation. High melting point solders incorporating cadmium shall not be used.

Only components suitable for the temperatures and pressures to which they are likely to be subjected when installed shall be selected for installation.

The maximum allowable temperature of a boiler selected for installation shall not exceed the maximum allowable temperature of any component of an existing heating system.

The maximum allowable pressure of each component in the heating system, including the boiler, shall be at least that at which the safety valve lifts.

COMMENTARY AND RECOMMENDATIONS ON 5.3

For existing flue systems containing asbestos, see Commentary and Recommendations on 6.10.1.1.

These requirements are particularly relevant when the maximum allowable temperature of the boiler used is in excess of 110 °C. See also BS 6880-1:1988, 3.4.5.2, and BS 6880-2:1988, 4.4.2.2 and 4.5.3.

The maximum setting of any temperature controller should be such that the fuel supply is cut off when the water at or near the boiler flow outlet rises to its predetermined temperature such that a margin of at least 17K exists below the temperature of saturated steam corresponding with the pressure at the highest point of the circulating system above the boiler. The setting of any safety temperature limiter should be such that the fuel supply is cut off when the temperature of water at or near the boiler flow outlet rises to a predetermined temperature providing a margin below the temperature of saturated steam corresponding with the pressure at the highest point of the circulating system above the boiler. This margin should be at least 6K. This control should be of the lock-out type requiring manual resetting.

6 Installation

6.1 Siting of the boiler

6.1.1 Prior to installation a risk assessment shall be carried out in order to verify the suitability of the location and the need for any additional safety features.

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

6.1.3 If the boiler is to be installed in a purpose-constructed boiler room, the room shall conform to **6.2**.

COMMENTARY AND RECOMMENDATIONS ON 6.1.3

It is desirable that consideration always be given to the installation of boilers in purpose-constructed boiler rooms.

6.1.4 Where a purpose-constructed boiler room is not available, measures shall be taken to protect the boiler from damage, unauthorized interference or access and to prevent extraneous material from encroaching on the manufacturer's recommended clearances.

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

COMMENTARY AND RECOMMENDATIONS ON 6.1.5

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.

6.1.6 Clearance between the boiler and its flue and any combustible material shall be in accordance with the manufacturer's instructions and shall conform to **6.10.13**.

6.1.7 The boiler installation shall be so designed that it does not cause adjacent spaces to exceed their design temperatures during operation of the boiler.

6.1.8 Boilers shall only be sited on floors and walls capable of:

- a) withstanding temperatures of at least 65 °C; and
- b) supporting the boilers when filled with water.

If a specially prepared boiler base is required, it shall be in accordance with the manufacturer's instructions.

COMMENTARY AND RECOMMENDATIONS ON 6.1.8

The design of the boiler base requires consideration of the heat losses, the number of boilers, their distance apart, and their hearth areas and shapes.

The manufacturer's instructions should be consulted as to whether special protection is required.

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

6.1.10 Boilers sited at or below ground level and in low-lying areas shall be provided with protection from the effects of flooding.

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

COMMENTARY AND RECOMMENDATIONS ON 6.1.11

This does not preclude the installation of such appliances into rooms which are low level with respect to one side of the building but open to ground level on the opposite side. In all cases, adequate low-level ventilation to the outside is essential.

6.1.12 For boilers installed on roof-tops or intermediate floors or in multi-storey buildings, precautions shall be taken to protect the buildings and the boiler houses against the effects of any water leakage from the boiler installations.

6.2 Boiler rooms

6.2.1 If a boiler is to be installed in a boiler room, it shall only be installed in a boiler room that has been constructed, or adapted, to conform to **6.2.2** to **6.2.5**.

6.2.2 Routes shall be provided for ready access to and egress from boiler rooms at all times.

COMMENTARY AND RECOMMENDATIONS ON 6.2.2

Access to boiler installations should preferably be from outside the building.

6.2.3 Any means of egress from the boiler room shall be readily openable from inside the room without the aid of a key and open in the direction of the escape route.

COMMENTARY AND RECOMMENDATIONS ON 6.2.3

The distance from any point within the boiler room to the nearest means of egress should not exceed 12 m. (For information on fire precautions in buildings see BS 9999.)

6.2.4 Where a boiler(s) is fired by 3rd family gases, the boiler room shall not have any openings to an immediately adjacent part of the building that is below ground level. Low-level ventilation shall be fitted to connected spaces below the location of boilers fired by 3rd family gases.

6.2.5 Permanent electric lighting shall be provided for the boiler room to ensure safe working conditions.

6.3 Equipment in the water circuit

NOTE BS EN 12828 specifies design requirements for the water circuit and its components.

6.3.1 Isolation of the water supply

6.3.1.1 If not supplied with the boiler, a means shall be provided for isolating the feedwater supply to the boiler. In the case of water connections to modular boilers this applies to each bank of modules.

NOTE Feedwater supplies might need additional arrangements to conform to water regulations.

6.3.1.2 Valves required to isolate boilers from the system shall be fitted such that isolation of the water supply is achieved safely.

COMMENTARY AND RECOMMENDATIONS ON 6.3.1.2

Three-way valves may be used so that, with the valve isolating the boiler from the system, the boiler flow is open to the outside atmosphere through the third port (see also 6.3.5.2.2.5).

6.3.2 Multiple boilers

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

6.3.3 Modular boilers

In the case of modular boiler installations, water isolating valves shall be fitted on the common flow and return manifolds of each bank of modules.

COMMENTARY AND RECOMMENDATIONS ON 6.3.3

Alternatively, this requirement may be satisfied by the fitting of isolating valves on each module of the modular installation.

6.3.4 Safety valves

6.3.4.1 Single boiler installations

6.3.4.1.1 General

6.3.4.1.1.1 Unless a safety valve(s) is already fitted, the boiler shall be provided with a safety valve(s) conforming to BS EN ISO 4126-1 and set to lift at a pressure not exceeding the maximum allowable pressure of any component of the heating system.

COMMENTARY AND RECOMMENDATIONS ON 6.3.4.1.1.1

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.

6.3.4.1.1.2 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.

6.3.4.1.1.3 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 6.3.4.1.1.2 AND 6.3.4.1.1.3

The fitting of the safety valve(s) directly to the boiler is preferred wherever possible.

6.3.4.1.2 Sizing of safety valves

6.3.4.1.2.1 Where a safety valve(s) is fitted in accordance with the manufacturer's instructions, this shall be sized on the basis of the individual boiler rating or, for banks of boilers, the total rated output of each bank of boilers.

6.3.4.1.2.2 For boilers installed on open vented hot water systems, the size of safety valves shall be not less than those given in Table 3 or shall be determined using the following equation:

$$R = 0.658 p A K_{dr}$$

where:

- R is the boiler output rating (in kW);
- p is the maximum absolute relieving pressure [in bar ³⁾],
i.e. (boiler design pressure $\times 1.1$) + 1;
- A is the flow area (in mm²);
- K_{dr} is the derated coefficient of discharge.

Table 3 Safety valve sizes (open vented systems only)

Rated output	Nominal size	Minimum area (A)
kW	mm	mm ²
<265	19	284
265 to 352	25	491
353 to 440	32	802
441 to 528	40	1 135
529 to 732	50	2 050
733 to 1 142	65	3 210
1 143 to 1 640	80	4 540

6.3.4.1.2.3 For boilers installed on unvented hot water systems, the size of safety valve(s) shall be determined using the following equation:

$$R = 0.329 p A K_{dr}$$

where:

R , p , A and K_{dr} have the same meanings as in **6.3.4.1.2.2**

6.3.4.1.3 Setting of safety valves

6.3.4.1.3.1 The setting of safety valves shall be determined using the following equation:

$$\text{Valve setting (in bar)} = 0.7 + \text{boiler operating pressure (in bar)}$$

NOTE 1 The operating pressure is dependent on the static head, the pressurizing equipment (where fitted) and the effect of any 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.

NOTE 2 Where fitted adjustable safety valves should be capable of being set and locked in position in order to avoid inadvertent adjustment.

6.3.4.1.3.2 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 maximum allowable pressure.

COMMENTARY AND RECOMMENDATIONS ON 6.3.4.1.3.2

The safety valve is fitted to protect the boiler and full discharge is achieved at the maximum design pressure of the boiler.

6.3.4.1.4 Discharge from safety valve

6.3.4.1.4.1 The discharge pipe from the safety valve shall fall continuously from the point of connection to the terminal so that the discharge pipe shall be

³⁾ 1 bar = 105 N/m² = 100 kPa.

self-draining and shall terminate in a visible position and where discharge cannot result in hazard to any person or to the plant.

6.3.4.1.4.2 The size of the discharge pipe shall be not less than the nominal size of the valve outlet.

6.3.4.2 Multiple boiler installations

6.3.4.2.1 Each boiler shall be provided with a safety valve(s) conforming to BS EN ISO 4126-1, and set to lift at a pressure not exceeding the maximum allowable pressure of any component of the heating system.

6.3.4.2.2 The sizing of the safety valve and its fitting shall conform to **6.3.4.1.2**.

6.3.4.3 Modular boiler installations

6.3.4.3.1 In the case of a modular boiler installation, each bank of modules shall be provided with a common safety valve(s) conforming to BS EN ISO 4126-1, unless each module is already fitted with a safety valve conforming to BS EN ISO 4126-1.

6.3.4.3.2 The common safety valve(s) shall be sized in accordance with **6.3.4.1.2** to suit the total rated output of the boiler bank and shall be fitted in accordance with **6.3.4.1.3**.

6.3.4.3.3 Any module in a modular installation that can be isolated from the water supply shall be fitted with a safety valve(s) conforming to BS EN ISO 4126-1, unless the module has:

- a) an integral direct-acting water-flow operated gas valve in addition to the safety temperature limiter; or
- b) a three-port valve utilized as the flow isolating valve and so arranged as to open the third port to outside atmosphere when the boiler module is isolated from the system.

6.3.5 Open vented systems

6.3.5.1 Cold feed pipes

6.3.5.1.1 Single boiler installations

6.3.5.1.1.1 The cold feed pipe shall be taken directly from a feed and expansion cistern that shall not supply water for any other purpose. It shall be no smaller than the applicable size specified in Table 2, and shall be connected to the boiler or to the boiler side of any valve on the return pipe.

6.3.5.1.1.2 The cold feed pipe shall be situated within the building and shall be insulated along those parts of its length where freezing conditions or condensation on the pipe can occur (see BS 5422 and BS 6700).

6.3.5.1.2 Multiple and modular boiler installations

6.3.5.1.2.1 The cold feed connection shall be either to the common return pipe upstream of the individual boiler isolating valves, or to each individual boiler return pipe downstream of the isolating valve. The cold feed to a multiple or a modular boiler installation shall be provided with a lockable isolating valve.

6.3.5.1.2.2 The cold feed pipe shall be no smaller than the applicable size specified in Table 4, and shall be taken directly from a feed and expansion cistern, which shall not supply water for any other purpose.