

BS 5546:2010



BSI Standards Publication

Specification for installation and maintenance of gas-fired water-heating appliances of rated input not exceeding 70 kW net

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Contents

Foreword *iii*

1	Scope	1
2	Normative references	1
3	Terms and definitions	3
4	Competence	6
5	Selection of equipment and pre-installation	7
6	Installation and location of water-heating appliances (general)	11
7	Installation and location of water-heating appliances (condensing)	44
8	Post-installation	55

Bibliography **59**

List of figures

Figure 1 – Circulator installation in cylinder/airing cupboard	17
Figure 2 – Example of a cistern conforming to 6.7.1.1	22
Figure 3 – Examples showing the clear space needed above storage cisterns	23
Figure 4 – Typical large instantaneous water-heating appliance installation on cistern supply	28
Figure 5 – Example of an indirect unvented (vented primary) storage system	30
Figure 6 – Example of direct circulating system	33
Figure 7 – Temporary and permanent connections to a primary circuit	35
Figure 8 – Example of indirect circulating system	37
Figure 9 – Connection of condensate drainage pipe to soil and vent stack	49
Figure 10a) – Connection of a condensate drainage pipe downstream of a sink, basin, bath or shower waste trap	51
Figure 10b) – Connection of a condensate drainage pipe upstream of a sink, basin, bath or shower waste trap	52
Figure 11 – External termination of condensate drainage pipe	53
Figure 12 – Example of a purpose-made soakaway	54

List of tables

Table 1 – Approval bodies and statutory regulations by country/territory	7
Table 2 – Maximum lengths of uninsulated hot water pipes	24
Table 3 – Vertical distance between draw-off tap and spillover level	25

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 62, an inside back cover and a back cover.

Foreword

Publishing information

This British Standard is published by BSI and came into effect on 30 June 2010. 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This British Standard supersedes BS 5546:2000+A1:2005, which is withdrawn.

Information about this document

The structure follows the approach used in other gas installation standards. Requirements, with corresponding commentary and recommendations, 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 revision has acknowledged 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 given in BS EN 1443) where a chimney is treated as a structure containing a flue (the passageway) and might include 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.

The requirements of this specification are supported by 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 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.

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.

Attention is drawn to the following statutory regulations:

- The Gas Safety (Installation and Use) Regulations 1998 [1];
- The Building Regulations 2000 (for England and Wales), as amended [2];
- The Building (Amendment) Regulations (Northern Ireland) 2010 [3];
- The Building (Scotland) Regulations 2004, as amended [4];
- The Building Regulations 2007 (for the Isle of Man) [5].

In this document, the following national regulations are referred to as the "Water Fittings Regulations [6]":

- The Water Supply (Water Fittings) Regulations 1999, in England & Wales;
- The Water Byelaws 2004 (Scotland), in Scotland;
- The Water Supply (Water Fittings) Regulations (Northern Ireland) 2009, in Northern Ireland.

1 Scope

This British Standard specifies requirements for the selection, installation, inspection, commissioning and maintenance of gas-fired water-heating appliances, which have a rated heat input not exceeding 70 kW, based on net calorific value.

It applies to water-heating appliances utilizing 1st, 2nd or 3rd family gases designed to operate in the condensing or non-condensing mode for the supply of hot water for domestic purposes in domestic dwellings or domestic dwellings in commercial premises.

This standard does not apply to:

- a) water-heating appliances with a rated input of over 70 kW;
- b) hot water supply systems in multiple dwellings supplied from a central source.

NOTE 1 Groups of water-heating 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 does not cover the detailed design and installation of the whole hot water distribution system, which was specified in BS 5449.

NOTE 2 With the publication of EN 12828, EN 12831 and EN 14336, BS 5449 has been withdrawn. These European standards, which have now been adopted as British Standards, are not aligned to UK design and installation practices; they cover commercial as well as domestic heating systems and exclude hot water. Consequently, they have been amended to include national annexes covering all the relevant material from BS 5449.

This standard applies to water-heating appliances which carry a CE mark and also to previously used water-heating appliances which do not carry the CE mark (see 5.3.1).

NOTE 3 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 4 It is essential that persons carrying out the installation of any gas appliance be competent to do so (see Clause 4).

NOTE 5 Some parts of this standard might be appropriate for the installation of pool and spa water-heating appliances. The manufacturer's instructions may advise which parts are not appropriate.

2 Normative references

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

BS 476-4, *Fire tests on building materials and structures – Part 4: Non-combustibility test for materials*

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 1566-2, *Copper indirect cylinders for domestic purposes – Part 2: Specification for single fed indirect cylinders*

BS 2879, *Specification for draining taps (screw-down pattern)*

BS 3198, *Specification for copper hot water storage combination units for domestic purposes*

BS 5422, *Method for specifying thermal insulating materials for pipes, tanks, vessels, ductwork and equipment operating within the temperature range -40°C to $+700^{\circ}\text{C}$*

BS 5440-1:2008, *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, *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 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 5871-1, *Specification for the installation and maintenance of gas fires, convector heaters, fire/back boilers and decorative fuel effect gas appliances – Part 1: Gas fires, convector heaters, fire/back boilers and heating stoves (2nd and 3rd family gases)*

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

BS 6283-2, *Safety and control devices for use in hot water systems – Part 2: Specifications for temperature relief valves for pressures from 1 bar to 10 bar*

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

BS 6798:2009, *Specification for installation and maintenance of gas-fired boilers of rated input not exceeding 70 kW net*

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 EN 1490, *Building valves – Combined temperature and pressure relief valves – Tests and requirements*

BS EN 12828, *Heating systems in buildings – Design for water-based heating systems*

BS EN 12897, *Water supply – Specification for indirectly heated unvented (closed) storage water heaters*

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; see bibliography.

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⁾

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 air vent

non-adjustable purpose-provided unit or assembly that is designed to allow permanent ventilation

3.2 back circulator unit

appliance with a rated net input of less than 6 kW designed for the production of stored sanitary hot water by gravity circulation, and which is designed to fit into a fireplace recess or a builder's opening

3.3 circulator

appliance with a rated net input of less than 6 kW which is designed for the production of stored sanitary hot water by gravity circulation

3.4 cistern

fixed container for holding water at atmospheric pressure

3.5 chimney

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

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

3.6 cold feed pipe

pipe that connects from a feed cistern to a cylinder, storage vessel, or to the primary side of a closed circuit

3.7 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.

¹⁾ INSTITUTION OF GAS ENGINEERS AND MANAGERS (IGEM). *Installation pipework on industrial and commercial premises*. IGEM/UP/2, Edition 2. Kegworth: IGEM, 2008.

²⁾ UKLPG. *LPG Piping System Design and Installation*. Code of Practice 22. Kenilworth: UKLPG, 2002.

- 3.8 compartment**
enclosure specifically designed or adapted to house an appliance, and which is not a habitable space
- 3.9 condensing appliance**
appliance designed to make use of the latent heat in the combustion products by condensing water vapour within the appliance
- 3.10 cylinders**
 - 3.10.1 cylinder (hot water storage vessel)**
vessel for storing hot water under pressure greater than atmospheric
 - 3.10.2 direct cylinder**
vessel for storing hot water that has been directly heated in a boiler or circulator
 - 3.10.3 indirect cylinder**
vessel in which stored water feeding a secondary circuit is heated by hot water in the primary circuit via a heat exchanger, without mixing of the primary or secondary water
 - 3.10.4 double-feed indirect cylinder**
indirect cylinder that requires separate feed cisterns to the primary and the secondary circuits
 - 3.10.5 single-feed indirect cylinder**
indirect cylinder which has only one cold feed pipe connection to supply both the primary and secondary circuits, so designed that the formation of an air seal during filling prevents mixing and accommodates the expansion of the primary water
- 3.11 distributing pipe**
pipe, other than a warning pipe, overflow pipe or flush pipe, which conveys water from a cistern or from hot water apparatus supplied from a feed cistern, the water being under pressure from that cistern
- 3.12 domestic dwelling**
self-contained unit designed to accommodate a single household
- 3.13 domestic water**
water supplied by a water supplier for drinking, washing, cooking or sanitary purposes, including hot water supplied through any outlet
- 3.14 draining tap**
tap fitted to drain water from a water system pipe or vessel
- 3.15 feed cistern**
cistern used for supplying cold water to hot water apparatus, cylinder or tank
- 3.16 float-operated valve**
valve for controlling the flow of water into a cistern, the valve being operated by the vertical movement of a float
- 3.17 flow pipe**
pipe, in a primary hot water circuit, in which water moves away from the boiler or circulator
- 3.18 flue**
passage for conveying combustion products to the outside air

- 3.19 flue duct**
duct containing the flue of a chimney configuration
- 3.20 flueless appliance**
appliance designed for use without connection to a flue, the products of combustion being allowed to mix with the air of the room or space in which the appliance is situated
NOTE This type of appliance is designated as "type A" in PD CEN/TR 1749.
- 3.21 gas installation pipework**
pipework or fittings from the outlet of the meter installation to points at which appliances/equipment are to be connected
NOTE This definition varies from that given in the Gas Safety (Installation and Use) Regulations 1998 [1].
- 3.22 greywater**
water originating from the mains water supply that has been used for bathing or washing, washing dishes or laundering clothes
- 3.23 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
- 3.24 instantaneous water-heating appliance**
appliance in which water is heated only as it is drawn off
- 3.25 open-flued appliance**
appliance designed to be connected to an open-flue chimney
NOTE 1 This type of appliance is designated as "type B" in PD CEN/TR 1749.
NOTE 2 These appliances are sometimes referred to as non-room-sealed appliances in European installation standards.
- 3.26 open-flue chimney**
chimney that evacuates the products of combustion to the outside air, the combustion air being drawn directly from the room, space or enclosure containing the water-heating appliance
- 3.27 operative**
person who installs, commissions, services or maintains a gas-fired water-heating appliance
- 3.28 pluming**
visible cloud formed when products of combustion exit from a chimney and are cooled below the dew point by mixing with external air
- 3.29 plume management kit**
chimney component designed to manage the discharge of the products of combustion such that any plume will not cause a nuisance
- 3.30 primary circuit**
assembly of water fittings in which water circulates between a boiler or other source of heat and a water-to-water heat exchanger
- 3.31 return pipe**
pipe, in a primary hot water circuit, in which water returns to the boiler or circulator

3.32 room-sealed appliance

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 which 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.

3.33 secondary circuit

assembly of water fittings in which water circulates between a water-to-water heat exchanger and draw-off branches

3.34 servicing valve

valve for stopping the flow of water in a pipe connected to a water fitting, to facilitate the maintenance or servicing of that fitting

3.35 stop valve

valve, other than a servicing valve, fitted in a pipeline to stop the flow of water

3.36 storage water-heating appliance

appliance in which a volume of water is heated under thermostatic control and stored, to be drawn off when required

3.37 storage system

system in which water is heated and held in a storage vessel

NOTE The water can be heated either directly in a water-heating appliance or circulator, or heated and stored in an indirect cylinder.

3.38 supply pipe (water)

pipe conveying wholesome water, from the public mains or other source, within a dwelling

3.39 terminal

fitting installed at the outlet of a chimney

NOTE These are fitted to assist products of combustion to escape, minimize draught and prevent entry of material which might block the flue.

3.40 vent pipe

pipe connecting a water system to the atmosphere

3.41 warning pipe

overflow pipe positioned so that the discharge of any water from its outlet, whether inside or outside a building, is conspicuous

3.42 water-jacketed tube heater

appliance in which water for domestic purposes, in a secondary circuit, is heated inside a coil located within stored primary hot water

NOTE The primary hot water can also be used for space-heating.

4 Competence

Persons carrying out design, installation, servicing or maintenance associated with and/or impacting on gas work, electrical installation, water supply and drainage or the ventilation provision for gas appliances shall be competent.

COMMENTARY AND RECOMMENDATIONS ON CLAUSE 4

It is a statutory requirement in the United Kingdom, Isle of Man and Guernsey (see Table 1) 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 (see Table 1) to operate and maintain such a register.

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.

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) Order 1996 [7]
Northern Ireland	Health and Safety Executive Northern Ireland (HSENI)	Gas Safety (Installation and Use) Regulations (Northern Ireland) 2004 [8]
Guernsey	Health and Safety Executive for the States of Guernsey [HSE (Guernsey)]	Health and Safety (Gas) (Guernsey) Ordinance 2006 [9]

Guidance on the individual competency 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" [10]. Persons deemed to be competent to carry out gas work are those who hold:

- a) a current certificate of competence in the type of activity issued under the Nationally Accredited Certification Scheme for Individual Gas Fitting Operatives (ACS) in line with ACOP (COP20); or*
- b) a National/Scottish Vocational Qualification (NISVQ) aligned in matters of gas safety.*

Persons therefore have a statutory duty to ensure that they are working to the appropriate competency standards.

5 Selection of equipment and pre-installation

5.1 Exchange of information and planning

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

COMMENTARY AND RECOMMENDATIONS ON 5.1

Liaison between the various trades carrying out the work is essential for the safe and efficient installation of a water-heating appliance.

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

- a) the availability and suitability of gas, electrical and water supplies;*
- b) the physical size, design and position of the water-heating appliance, and its relationship to structural support and to combustible materials;*

NOTE 1 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 water-heating appliances.

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

NOTE 2 Information on gas installations in timber framed and light steel framed buildings is given in IGE/UP17, Edition 2 [11].

NOTE 3 Information on gas installations in flats and other multi-dwelling buildings is given in IGE/G/5 [12].

- d) *the size, height, type, support and route of the chimney and the position of termination, including the possible consequences of any plumbing;*

NOTE 4 Particular notice is drawn to the advice in BS 5440-1:2008, Clause 12, on the connection to SE-duct, U-duct and shared chimneys.

NOTE 5 Some modern room-sealed fanned draught water-heating appliances are designed for long flue ducts which enable builders to site water-heating appliances away from external walls and conceal the flue ducts and air-supply ducts within voids. Attention is drawn to the Gas Safety (Installation and Use) Regulations 1998 [1] concerning the need for inspection throughout the length of the flue duct. Detailed information is given in Gas Safe Register Technical Bulletin 008 [13].

- e) *the provision of adequate air for combustion and ventilation;*
- f) *the position of any drains for condensate or pressure/temperature relief valve discharge;*
- g) *the manufacturer's instruction 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 boilers to reduce the rate of accumulation of limescale;*
- h) *whether the system pipework is adequately sized.*

Consultation with official bodies

Attention is drawn to the Water Fittings Regulations [6] which require that the water supply company is notified regarding the proposed installation and its consent obtained.

In addition, the following official bodies might need to be consulted for the reasons given:

- 1) *the local authority, with regard to building regulations and planning application requirements;*
- 2) *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 water heating;*
- 3) *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.*

5.2 Selection of water-heating system

5.2.1 The system shall be selected to suit the requirements of the user, taking account of locations, the quantity and temperature of the hot water required, costs (including maintenance and fuel costs), water delivery rates and the characteristics of the different water-heating systems.

The manufacturer's instructions shall be consulted for performance data.

COMMENTARY AND RECOMMENDATIONS ON 5.2.1

Instantaneous appliances

In appliances without a thermal store, water is heated after the draw-off tap is turned on. As a consequence, there might be a short delay between the demand for hot water and its delivery. (See 5.3.2.)

Storage

In systems with primary water storage, water to be drawn off passes through a coil immersed in the stored hot water (a water-jacketed tube heater). This gives a rapid response, but initially water might be delivered at a temperature close to that of the stored water (which could be the central heating flow temperature of 82 °C).

In such cases, in hard water areas, it might be necessary to take precautions against scaling. (See 6.7.7.)

In systems without primary storage, water for domestic purposes is stored and its temperature can be controlled according to delivery conditions.

Combination boilers

Combination boilers with no water storage capacity have typical hot water delivery rates between 6 l/min and 11 l/min with a 45 °C temperature rise. If the combination boiler incorporates primary water storage, the delivery rate depends on the pressure and flow rate available to the appliance, e.g. from the water mains, and the pipework resistance.

5.2.2 Where a water storage system is selected, the water capacity shall be sufficient for its intended use (see BS 6700).

COMMENTARY AND RECOMMENDATIONS ON 5.2.2

Where only a sink or basin is to be supplied, a water-heating appliance of small storage capacity (up to about 10 L) may be used.

Where a storage system is required to supply a bath or a number of draw-off points, a water-heating appliance which has a large water storage capacity should be used. Typical storage capacities range from 45 L to 120 L.

Where a suitable hot water storage vessel exists already, a circulator or back circulator unit might be most appropriate.

Where a water storage system is selected and a rapid recovery rate is required, a boiler should be used. The rated heat output of a boiler is not normally less than 10 kW, and it is therefore capable of providing a faster recovery rate than a circulator. This type of appliance is frequently used to provide a combined space-heating and hot water service (see BS 6798).

Where a higher flow rate or delivery pressure is sought, direct connection to the mains, pump-assisted systems or a high-head cistern should be used. Before any water-heating appliance is connected directly to the mains water supply, it should be ascertained that the mains water supply to the property is adequate to satisfy the expected demand.

Where a pump boosting system is to be used, refer to BS 6700.

5.3 Selection of water-heating appliance

5.3.1 A new water-heating appliance selected for installation shall carry a CE mark.

A previously used water-heating appliance selected for installation shall either carry a CE mark, or shall conform to an appropriate British Standard.

The water-heating appliance shall only be connected to and supplied with the gas for which it was designed and shall be installed in such a way as to prevent danger to any person.

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

COMMENTARY AND RECOMMENDATIONS ON 5.3.1

The HSE publication, Safety in the installation and use of gas systems and appliances [14] should be consulted.

For CE-marked appliances

The operative should ensure that the water-heating 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 water-heating appliance adjusted for natural gas;*
 - 2) *"G31 and/or propane 37 mbar" for a water-heating appliance adjusted for propane;*
 - 3) *"G30 and/or butane 29 mbar" for a water-heating appliance adjusted for butane;*
 - 4) *"G30, G31 and/or butane/propane 29/37 mbar" for a water-heating appliance which will burn either butane or propane at the correct pressure.*

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

Previously used (e.g. second hand) appliances without a CE mark

If a previously used water-heating appliance which does not carry the CE mark is to be installed, the operative should be satisfied that the appliance is safe in construction and can be used without constituting a danger. The appliance should be fitted in accordance with the manufacturer's instructions. If these instructions are not available, the operative should contact the manufacturer and obtain a copy before fitting the appliance.

A previously used water-heating appliance conforming to BS 5258-1, BS 5258-7, BS 5258-8 or BS 5258-15, or BS 5386-1, BS 5386-2 or BS 5386-5, as appropriate, may be considered safe to install.

For all water-heating appliances

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

The operative should check the data provided with the appliance to confirm that the 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.

5.3.2 A flueless instantaneous water-heating appliance shall only be selected if the draw-off tap or other equipment (such as a washing machine) to be supplied is within the room or space in which the water-heating appliance is installed.

COMMENTARY AND RECOMMENDATIONS ON 5.3.2

Flueless instantaneous water-heating appliances should have a label, attached in a prominent place, advising that the water-heating appliance should not be used continuously for more than five minutes.

Small flueless instantaneous water-heating appliances, with an output of between 8 kW and 10 kW, will provide approximately 2.6 L/min of water raised through 50 °C. They normally supply hot water through a swivel spout. Some models have the additional facility for making a direct connection to a draw-off point.

5.3.3 No instantaneous water-heating appliance, whether new or used, shall be installed unless it is room-sealed or it incorporates a safety control designed to shut down the appliance before there is a dangerous build-up of products of combustion in the room concerned.

5.3.4 Water-heating appliances selected for installation in a bathroom or shower room shall be room-sealed.

COMMENTARY AND RECOMMENDATIONS ON 5.3.4

Large instantaneous water-heating appliances have an output within the range of 17 kW to 35 kW, which provides approximately 5 L/min to 10 L/min respectively, raised through 50 °C. They are appropriate for supplying hot water to a bath or to a number of draw-off points.

5.3.5 Water-heating appliances selected for installation in a room intended to be used for sleeping accommodation shall be of a type which can be installed in accordance with **6.4.2.2**.

6 Installation and location of water-heating appliances (general)

6.1 Air supply for combustion and ventilation

A water-heating appliance shall have an air supply for combustion and ventilation which conforms to BS 5440-2.

COMMENTARY AND RECOMMENDATIONS ON 6.1

BS 5440-2 specifies the air supply requirements of open-flued and room-sealed appliances installed in compartments and in rooms.

For premises insulated against external noise (e.g. noise of traffic, aircraft), attention is drawn to local noise insulation regulations.

6.2 Chimney system

With the exception of flueless appliances, the products of combustion shall be conducted to the outside air. The chimney system shall conform to BS 5440-1.

COMMENTARY AND RECOMMENDATIONS ON 6.2

The plume from a chimney outlet might cause a nuisance to the user or neighbouring properties. Further guidance is given in 7.2.

Guidance on chimneys for permanently sited mobile homes, caravans and boats is given in BS 5482-2 and PD 5482-3.

Chimneys for residential park homes conforming to BS 3632 should be installed following the guidance given in BS 5440-1.

Information on chimneys for timber framed and light steel framed buildings is given in IGE/UP17, Edition 2 [11].

Information on room-sealed fanned draught flue systems concealed within voids is given in Gas Safe Register Technical Bulletin 008 [13].

6.3 Materials and components

All materials and components used in the installation shall conform to the applicable British or European Standard if such a standard exists.

Materials containing asbestos shall not be used. High-melting-point solders incorporating cadmium shall not be used.

NOTE Attention is drawn to the Water Fittings Regulations [6], which require that materials in contact, or likely to come in contact, with wholesome water (water supplied for such domestic purposes as exist in or include, cooking, drinking, food preparation or washing) do not constitute a toxic hazard, do not contribute to microbiological growth and do not give rise to unpleasant taste or odour, cloudiness or discolouration of the water. For example, solder containing lead is not to be used in pipework conveying water which is required to be wholesome.

COMMENTARY AND RECOMMENDATIONS ON 6.3

Where no British or European Standard exists, materials and components should be of a suitable quality, and should be designed, constructed and installed to fulfill their intended purpose and so as not to put the safety of persons at risk.

Products for installation in the United Kingdom should be selected from those which have been verified and listed in the Water Fittings and Materials Directory published by the Water Regulations Advisory Scheme (WRAS). (See www.wras.co.uk/directory.)

6.4 Location

6.4.1 General

Provision shall be made, on installation, for access to all components that require servicing, adjustment or periodic replacement. The space around the water-heating appliance shall be at least the minimum specified in the manufacturer's installation instructions.

The floor or wall on which the water-heating appliance is to be mounted shall be protected as detailed in the manufacturer's instructions.

For any room or internal space which falls into more than one of the categories covered in 6.4.2 and 6.4.3, the more stringent requirements shall apply.

A flueless water-heating appliance shall not be fitted in any room of volume less than 5 m³.

COMMENTARY AND RECOMMENDATIONS ON 6.4.1

The space around the water-heating appliance should be adequate:

- a) to ensure sufficient air circulation for any draught diverter to operate;*
- b) to ensure sufficient air for combustion and cooling;*
- c) for maintenance and servicing.*

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

Water-heating appliances should not be located above gas or electricity meters.

Where a water-heating 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 water-heating appliance that can be installed in a private garage except where the manufacturer states otherwise. Great care is required in the location of a water-heating appliance in any premises where concentrations of flammable vapour could accumulate, e.g. commercial garages and associated workshops.

6.4.2 Room installations

6.4.2.1 Bathrooms and shower rooms

Water-heating appliances installed in a room containing a fixed bath or shower shall be room sealed. (See also 6.6.)

The electrical installation shall conform to BS 7671.

The electrical supply to the water-heating appliance shall be provided via a switched fused connection unit; however, socket-outlets are allowed in rooms containing a bath or shower as long as they are 3 m from the edge of Zone 1 and RCD protected.

COMMENTARY AND RECOMMENDATIONS ON 6.4.2.1

Installation in a bathroom or shower room should only be considered if there is no alternative location.

Particular attention is drawn to BS 7671 with regard to zoning requirements in locations containing a bath or shower and to the requirement for RCD protection and protective equipotential bonding (if applicable).

6.4.2.2 Bedrooms and bed-sitting rooms

For water-heating appliances to be installed in a room used, or intended to be used, for sleeping accommodation, the following conditions shall apply.

- a) Any appliance of heat input greater than 14 kW gross (12.6 kW net) shall be room sealed.
- b) An appliance of 14 kW gross (12.6 kW net) heat input or less may:
 - 1) be room sealed; or
 - 2) be open flued, and incorporate a safety control which shuts down the appliance before there is a dangerous quantity of products of combustion in the room concerned; or
 - 3) be flueless, if the appliance heat input is 12 kW gross (10.8 kW net) or less, and incorporate a safety control which shuts down the appliance before there is a dangerous quantity of products of combustion in the room concerned and have any permanent ventilation required communicating directly with outside air. Such water heating appliances shall only be installed in a room with an openable window or equivalent as specified in BS 5440-2.
- c) An appliance installed in a bedroom or bed-sitting room where the volume of the room is less than 20 m³ shall be room sealed.

The conditions in item a), item b1) and item b2) shall also apply to installations in cupboards or compartments in bedrooms or bed-sitting rooms, or cupboards, compartments or spaces adjacent to bedrooms or bed-sitting rooms.

COMMENTARY AND RECOMMENDATIONS ON 6.4.2.2

Installation in a bedroom or bed-sitting room should only be considered where there is no alternative location.

See 6.4.3 for further information on compartments and cupboards.

When planning a bedroom or bed-sitting room installation, consideration should be given to factors affecting amenity, such as noise of operation and the need for servicing.

6.4.2.3 Cloakrooms and/or toilets

Flueless water-heating appliances shall not be installed in cloakrooms and/or toilets where the volume of the room is 5 m³ or less.

COMMENTARY AND RECOMMENDATIONS ON 6.4.2.3

Any air vent in a toilet or cloakroom should communicate directly with the outside air.

6.4.2.4 Basement rooms

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

COMMENTARY AND RECOMMENDATIONS ON 6.4.2.4

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

6.4.2.5 Living rooms, kitchens, utility rooms, halls and passageways

Where water-heating appliances and circulators designed for installation in fireplaces are used, the installation shall conform to BS 5871-1.

COMMENTARY AND RECOMMENDATIONS ON 6.4.2.5

All types of water-heating appliance are permitted in living rooms, kitchens, utility rooms, halls and passageways. Attention is drawn to fire regulations.

When a living room installation is planned, careful consideration should be given to factors affecting amenity, such as noise of operation, condensation, appearance and the need for servicing.

6.4.3 Compartment and cupboard installations**6.4.3.1 General**

Flueless water-heating appliances shall not be installed in compartments or cupboards.

6.4.3.2 Compartments

6.4.3.2.1 The water-heating appliance compartment shall be a fixed rigid structure, the internal surfaces of which conform to the appliance installation instructions.

COMMENTARY AND RECOMMENDATIONS ON 6.4.3.2.1

If the appliance manufacturer's installation instructions do not give specific advice, any internal surface of the compartment which is of combustible material should either be at least 75 mm from any part of the appliance or be lined with non-combustible material. Methods of determining whether a material can be described as combustible or non-combustible are given in BS 476-22. For further advice, see HSE publication, Safety in the installation and use of gas systems and appliances [14].

6.4.3.2.2 The compartment shall permit access for inspection and servicing of the water-heating appliance and any ancillary equipment. A notice shall be fixed in a prominent position within the compartment to warn against its use as a storage cupboard. The compartment shall be fitted with a door that will permit withdrawal of the appliance and any ancillary equipment.

6.4.3.2.3 If the compartment houses an open-flued water-heating appliance, neither the door nor the air vents shall communicate with a bedroom or bed-sitting room or a room containing a bath or shower (see **6.4.2.1** and **6.4.2.2**).

6.4.3.2.4 Open-flued water-heating appliances installed in compartments communicating directly with a room used, or intended to be used, for sleeping accommodation shall have a heat input of less than 14 kW gross (12.6 kW net) and shall include a safety control designed to shut down the water-heating appliance before a dangerous quantity of the products of combustion accumulates in the room concerned (see **6.4.2.2**).

6.4.3.2.5 Where necessary, according to manufacturer's instructions, the compartment shall incorporate air vents for cooling and air for combustion and correct operation of the chimney (see **6.1** and **6.2**).

6.4.3.2.6 An appliance installed in an understairs cupboard shall conform to the following requirements.

- a) Where the premises in which the cupboard is located is no more than two storeys above ground level, the cupboard shall conform to **6.4.3.2.1** to **6.4.3.2.5**.
- b) Where the premises in which the cupboard is located is more than two storeys above ground level, all the internal surfaces of the cupboard, including the base, shall either be non-combustible in accordance with BS 476-4 or be lined with non-combustible material. The walls, roof and base of the cupboard shall have a fire resistance of not less than 0.5 h when determined in accordance with BS 476-22, and the air vents shall be direct to outside air.

COMMENTARY AND RECOMMENDATIONS ON 6.4.3.2.6

An understairs cupboard installation should only be considered if no practicable alternative location is available.

Whenever possible, the water-heating appliance in an understairs cupboard should be room sealed.

6.4.3.3 Cylinder/airing cupboard installations

An airing cupboard adapted to house a circulator shall conform to **6.4.3.2**.

The airing spaces shall be separated from the appliance compartment by a non-combustible partition, which may be perforated, if necessary, by apertures having a major dimension no greater than 13 mm.

Any flue duct which passes through the airing space shall be double-walled or thermally insulated, unless the duct is surrounded by an air inlet duct.

Where the water-heating appliance is open flued, the draught diverter and the air vents shall be in the appliance compartment and shall connect to the room and not the airing space. The air vents shall be in accordance with BS 5440-2.