

BRITISH STANDARD

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**

ICS 91.060.40



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Summary of pages

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Foreword

Publishing information

This part of BS 5440 is published by BSI and came into effect on 31 March 2008. It was prepared by Technical Committee GSE/30, *Gas installations (1st, 2nd and 3rd family gases)* to support and complement BS EN 15287-1 and BS EN 15287-2.

Supersession

This part of BS 5440 supersedes BS 5440-1:2000+A2:2005, which is withdrawn.

Information about this document

BS 5440 is published in parts as follows:

- *Part 1: Specification for installation of gas appliances to chimneys and for maintenance of chimneys;*
- *Part 2: Specification for installation and maintenance of ventilation for gas appliances.*

This revision has been undertaken for the following reasons.

- a) To acknowledge that European work on chimney standards has brought about the need to redefine chimney concepts and adopt common terminology consistent with the range of products used across the whole European Community. To align with European Standards, (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industry, which has regarded a chimney as a masonry structure generally associated with solid fuel appliances, has been superseded. Attention is drawn to the definitions for chimney (**3.9**), connecting flue pipe (**3.17**), flue (**3.28**) and flue liner (**3.31**), air supply duct (**3.1**) and room-sealed chimney configuration (**3.44**).
- b) To recognize and refer to recent changes in building legislation.
- c) To cover recent developments in appliance design, flue material and practical experience in the disposal of products of combustion by means of flues.
- d) To improve advice on flueing and ventilation installation practices and reduce occurrences of CO related incidents attributable to flueing and ventilation for gas appliances.

It is essential that the appropriate specifications/codes of practice are consulted on all aspects of appliance and flue installation.

Use of this document

It has been assumed in the preparation of this British Standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

This British Standard allows gas appliance and/or chimney manufacturers' instructions to recommend 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.

Requirements in this standard are drafted in accordance with *The BSI guide to standardization – Section 2: Rules for the structure, drafting and presentation of British Standards*, subclause **11.3.1**, which states, "Requirements should be expressed using wording such as: 'When tested as described in Annex A, the product shall ...'". This means that only those products that are capable of passing the specified test will be deemed to conform to this standard.

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 statutory regulations.

- a) The gas safety regulations for the appropriate legislative region:
- **Gas Safety (Installation and Use) Regulations 1998** [1];
 - **Gas Safety (Installation and Use) Regulations (Northern Ireland) 2004** [2].

These control all aspects of the ways gas fired systems are installed, maintained and used, mainly in domestic and commercial premises, (e.g. offices, shops, hospitals, educational and other public buildings), and the classes of persons who might undertake gas work.

- b) The building regulations for the appropriate legislative region:
- **Building Regulations for England and Wales 2000** [3];
 - **Building Regulations (Northern Ireland) Statutory Rules 2000** [4];
 - **Building Standards (Scotland) Regulations 1990** [5];
 - **Building Regulations (Isle of Man) 2003** [6].
- c) **Gas Appliance (Safety) Regulations 1995** [7].

These control the supply of new gas appliances and specify the conditions required for CE marking.

- d) **Gas Safety (Application) (Isle of Man) Order 1996** [8].

1 Scope

This part of BS 5440 specifies requirements for the installation of gas appliances to chimneys, chimney installation work likely to be undertaken by gas engineers and operatives working under UK gas industry conditions and requirements for the maintenance of chimneys. It is applicable to open flue chimneys for Type B gas appliances and room-sealed chimney configurations for Type C gas appliances, each of rated input not exceeding 70 kW net (see Note 2 and Note 3), burning 1st, 2nd or 3rd family gases. It applies to chimneys of the natural draught or fanned draught type and is applicable to open flue chimneys and room-sealed chimneys supplied with the appliance as well as to those supplied separately.

NOTE 1 Type B and Type C appliances are explained in Table A.1.

It complements the requirements for the design, installation and commissioning of chimneys as required in BS EN 15287-1 and BS EN 15287-2 and requires extra details that are specific to the UK gas industry. This is kept in perspective by quoting some details of BS EN 15287-1 and BS EN 15287-2.

It specifies the following:

- requirements for the selection of the appropriate flueing option for gas appliances in the UK;
- requirements for the installation of gas appliances to new chimneys, or chimney configurations;
- requirements for the installation of gas appliances to existing chimneys or chimney configurations;
- requirements for the installation of appliances which carry a CE mark and for which the manufacturer's instructions are available to the installer;
- requirements installation of appliances which do not carry a CE mark and used/second-hand appliances for which the manufacturer's instructions are available to the installer.

This part of BS 5440 is applicable to:

- complete chimney and all chimney components from the appliance connection to the discharge point into outside air;
- the installation of gas appliances to existing chimneys that were intended originally for appliances burning other fuels;
- chimneys for residential park homes but not to chimneys for leisure accommodation vehicles.

This part of BS 5440 is not applicable to gas-fired incinerators. Refer to BS 5871-3 for the installation of decorative fuel effect appliances.

This part of BS 5440 includes compatibility of appliances installed in the UK with new chimneys designated under BS EN 1443 and with existing chimneys, including non-designated chimneys.

NOTE 2 In the case of an individual appliance connected to a chimney the 70 kW maximum rated input relates to that appliance. In the case of more than one appliance in the same room connected to a single chimney the 70 kW maximum rated input relates to the sum of the rated inputs of all the appliances. In the case of appliances in separate dwellings connected to a shared flue in a chimney, e.g. a SE-duct or a U-duct, the 70 kW maximum rated input relates to the rated input of each individual appliance.

NOTE 3 Installation of LPG (liquefied petroleum gas) systems in leisure accommodation vehicles is specified in BS EN 1949 and further guidance is given in the Institution of Gas Engineers and Managers publication IGE/UP/8 [9].

NOTE 4 Installation of gas-fired hot water boilers having rated inputs exceeding 70 kW is specified in BS 6644.

*NOTE 5 The data in this British Standard refers to heat input expressed in terms of net calorific values (CV) with conversion given for natural gas gross CV quoted in brackets where appropriate. The ratio of gross heat input: net heat input is approximately 1.1:1 for natural gas propane and butane. For example, conversion of 9 kW input based on gross CV for natural gas to the equivalent net CV input is as follows:
net input = $9.0/1.1 = 8.2$ kW.*

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 715, *Specification for metal flue boxes for gas-fired appliances not exceeding 20kW*

BS 5440-2:2000+A2:2004, *Installation and maintenance of flues and ventilation for gas appliances of rated input not exceeding 70 kW net (1st, 2nd and 3rd family gases) – Part 2: Specification for installation and maintenance of ventilation for gas appliances*

BS 5546, *Specification for installation of hot water supplies for domestic purposes, using gas-fired appliances of rated input not exceeding 70 kW*

BS 5864, *Installation and maintenance of gas-fired ducted air heaters of rated input not exceeding 70 kW net (2nd and 3rd family gases) – Specification*

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 5871-2, *Specification for the installation and maintenance of gas fires, convector heaters, fire/back boilers and decorative fuel effect gas appliances – Part 2: Inset live fuel effect gas fires of heat input not exceeding 15 kW, and fire/back boilers (2nd and 3rd family gases)*

BS 5871-3, *Specification for the installation and maintenance of gas fires, convector heaters, fire/back boilers and decorative fuel effect gas appliances – Part 3: Inset live fuel effect gas fires of heat input not exceeding 15 kW, and fire/back boilers (2nd and 3rd family gases)*

BS 6230, *Specification for installation of gas-fired forced convection air heaters for commercial and industrial space heating (2nd and 3rd family gases)*

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

BS 6896, *Specification for installation of gas-fired overhead radiant heaters for industrial and commercial heating (2nd and 3rd family gases)*

BS 7461, *Specification for electrically operated automatic gas shut-off valves fitted with throughput adjusters, proof of closure switches, closed position indicator switches or gas flow control*

BS EN 161, *Automatic shut-off valves for gas burners and gas appliances*

BS EN 1443:2003, *Chimneys – General requirements*

BS EN 1457, *Chimneys – Clay/ceramic flue liners – Requirements and test methods*

BS EN 1806, *Chimneys – Clay/ceramic flue blocks for single wall chimneys – Requirements and test methods*

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*

BS EN 1857:2003, *Chimneys – Components – Concrete flue liners*

BS EN 1858, *Chimneys – Components – Concrete flue blocks*

BS EN 13384-2, *Chimneys – Thermal and fluid dynamic calculation methods – Part 2: Chimneys serving more than one heating appliance*

BS EN 15287-1:2008, *Chimneys – Design, installation and commissioning of chimneys – Part 1: Chimneys for nonroomsealed heating appliances*¹⁾

BS EN 15287-2:2008, *Chimneys – Design, installation and commissioning of chimneys – Part 2: Chimneys for roomsealed appliances*¹⁾

BS EN 60079-10:2003, *Electrical apparatus for explosive gas atmospheres – Part 10: Classification of hazardous areas*

IGE/UP/7:2006 (Edition 2), *Gas installations in timber framed and light steel framed buildings*²⁾

¹⁾ In preparation.

²⁾ Available from the Institution of Gas Engineers and Managers, Charnwood Wing, Holywell Park, Ashby Road, Loughborough, Leicestershire, LE11 3GH. <http://www.igem.org.uk/>.

3 Terms and definitions

For the purposes of this part of BS 5440, the following terms and definitions apply.

- 3.1 air supply duct**
duct in a chimney configuration only for conveying combustion air to a room-sealed appliance
- 3.2 appliance compartment**
enclosure, not being a habitable space, specifically designed or adapted to house one or more gas appliances only
- 3.3 balanced compartment**
sealed enclosure, not being a habitable space, specifically designed or adapted to house one or more open-flued gas appliances only, but which takes its air supply from a place outside the enclosure which is adjacent to the flue discharge point
NOTE See Clause 11.
- 3.4 balanced flue appliance**
room-sealed appliance which draws its combustion air from a point adjacent to the point at which the combustion products are discharged, the inlet and outlet being so disposed that wind effects are substantially balanced
NOTE This is referred to as Type C in PD CEN/TR 1749:2005.
- 3.5 bathroom**
room or space containing a functioning bath
- 3.6 boundary**
curtilage of the land or buildings belonging to and under the control of the building owner
- 3.7 branched chimney**
shared chimney serving open-flued appliances situated on two or more floors
NOTE This was known as a branched flue system in BS 5440-1:2000.
- 3.8 builder's opening**
enclosure constructed by the builders to accommodate fireplace components
- 3.9 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.). It may be either an open flue chimney for use with an open-flued appliance or a room-sealed chimney configuration for use with a room-sealed appliance.
- 3.10 chimney plate**
permanent plate or label fixed in a secure and accessible position in the building giving details of the chimney or flue installation

3.11 closed flue

flue that is closed to a room or internal space due to the absence of a draught diverter, flue break and any draught break within the chimney; combustion air is drawn directly from the room or space containing the appliance

NOTE This is now an obsolete term for an open flue without a draught diverter.

3.12 common flue system

shared open flue system serving two or more appliances installed in the same room or space

3.13 condensate discharge pipe

pipe, which might also be part of the appliance chimney, resistant to corrosion from condensate, formed from the products of combustion, which is leak free, and along which condensate flows

3.14 condensate drain

fixture in a chimney or appliance, resistant to corrosion from condensate formed from the products of combustion, where condensate can be drained

3.15 condensate-free length

length of individual chimney which can be calculated to maintain the temperature of the flue gases above the dew point and thereby ensure that condensate from the products of combustion does not form on the inner wall of the chimney under the normal operating cycle of the appliance

3.16 condensing appliance

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

3.17 connecting flue pipe

component used for connecting an appliance outlet and the chimney

3.18 custom-built chimney

chimney that is installed or built on-site using a combination of compatible chimney components that may be from one or different sources

3.19 decorative fuel effect gas appliance

appliance designed to burn gas for a decorative effect

3.20 draught break

opening into any part of a chimney, including that part integral with the appliance

3.21 draught diverter

device for preventing conditions in a secondary flue from interfering with the combustion performance of an appliance

3.22 effective height

height of straight vertical circular chimney, measured from the base of the fire to the outlet of the chimney, of the same cross-sectional size as the chimney under consideration, produces the same flue flow rate as the chimney under consideration equal to the equivalent height plus 0.65 m

NOTE This definition applies only to gas fires and combined gas fire/back boiler units.

3.23 equivalent height

height of the straight vertical circular chimney, measured from the appliance flue spigot to the outlet of the chimney, of the same cross-sectional size as the chimney under consideration, which produces the same flue flow rate as the chimney under consideration

3.24 fan diluted chimney

fanned draught chimney connected to an open-flued appliance in which the products of combustion are diluted with air

3.25 fanned draught chimney

chimney in which the removal of the products of combustion is dependent on a fan

3.26 fireplace recess

recess formed by the inclusion of fireplace components in a builder's opening

3.27 flat roof

section of a roof which is horizontal or close enough to horizontal such that any airflow over it does not affect the operation of a chimney terminating above the roof, i.e. within 20° of the horizontal

NOTE This would include a bow string truss roof such as might be encountered in a residential park home.

3.28 flue

passage for conveying combustion products to the outside air

3.29 flue break

opening into a secondary flue in the same room as, and in addition to, the opening at the draught diverter

3.30 flue duct

duct containing the flue of a chimney

3.31 flue liner

wall of a chimney consisting of components the surface of which is in contact with the products of combustion

NOTE This includes a rigid or flexible liner inserted into a chimney to form the flue and the inner wall of a metal or masonry chimney construction.

3.32 flueless appliance (Type A)

appliance which is designed to be used without a flue and in which the products of combustion mix with the surrounding air

3.33 Installation instructions**3.33.1 appliance manufacturer's instructions**

instructions prepared by the appliance manufacturer giving detailed information and requirements on how the appliance is to be installed

NOTE Such instructions should not be confused with other documents supplied by the manufacturer, e.g. sales literature.

3.33.2 chimney manufacturer's instructions

instructions provided with the product by the manufacturer giving detailed information on how the chimney or chimney component is to be installed and checked

NOTE Such instructions should not be confused with other sales or marketing related literature supplied by the manufacturer.

3.34 leisure accommodation vehicle

unit of living accommodation for temporary or seasonal occupation that might meet the requirement for the construction and use of road vehicles

3.35 main flue

part of a shared open flue system carrying products of combustion from two or more appliances

3.36 natural draught chimney

chimney in which the draught is provided by the thermal force arising from the heat of the products of combustion

3.37 open flue chimney

chimney that evacuates the products of combustion to the outside air, the combustion air being drawn directly from the room or space containing the appliance

3.38 open-flued appliance

appliance designed to be connected to an open flue chimney

NOTE 1 These appliances are referred to in BS EN 15287 as "non-room-sealed" appliances.

NOTE 2 This is equivalent to a Type B appliance in PD CEN/TR 1749:2005.

3.39 passive stack ventilation

form of natural ventilation created by pressure differences due to wind and/or temperature differences induced by an essentially vertical duct to remove odours and moisture-laden atmosphere at roof level

NOTE Used typically in "wet" rooms, e.g. kitchens, bathrooms/shower rooms.

3.40 plume management kit

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

3.41 pluming

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

3.42 residential park home

mobile home designed for permanent residential accommodation that does not meet the requirements for construction and use for a road vehicle

3.43 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 open air outside the premises and which vents the products of combustion directly to open air outside the premises

cf. definition in BS EN 15287-2.

NOTE This is equivalent to a Type C in PD CEN/TR 1749:2005.

3.44 room-sealed chimney configuration

unit consisting of a flue duct and air supply duct which can be concentric or separate for a room-sealed appliance

NOTE In this context “concentric” refers where a flue duct is located inside the air supply duct they do not necessarily share a common axis. (This includes assemblies previously called balanced flues).

3.45 secondary flue

flue in a chimney for an open-flued appliance connecting a draught diverter or draught break to a outlet

3.46 SE-duct

duct rising vertically through a building, open at its extremities, and serving to bring combustion air to, and to take products to the outside air from, Type C₂ room-sealed appliances

3.47 shared chimney

chimney serving two or more appliances

3.48 shower room

room or space containing a functioning shower

3.49 subsidiary flue

part of a shared open flue system which connects the appliance outlet to the main flue

3.50 system chimney

chimney that is installed using a combination of compatible chimney components, obtained or specified from one manufacturing source with product responsibility for the whole chimney

3.51 terminal

fitting installed at the outlet of a chimney

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

3.52 terminal guard

device fitted over a terminal in order to protect persons from contact with, prevent interference with, and prevent damage to the terminal, and prevent flue blockage

3.53 U-duct

duct in the form of a vertical “U”, the ends being open and adjacent, one limb of which provides combustion air to the bottom of the “U”, whilst room-sealed appliances, (Type C₂), (both air supply duct and flue duct) are fitted to the other limb

NOTE A continental European arrangement fits the air supply duct of the appliance (Type C₄) to one limb and the flue duct to the other (see Clause 12).

4 Competence

Persons carrying out any design, installation and maintenance work shall be competent.

COMMENTARY ON CLAUSE 4

Under the Gas Safety (Installation and Use) Regulations [1] a business or self employed person who carries out work on gas fittings has to be a “member of a class of persons approved for the time being by the Health and Safety Executive (HSE)”.

At the time of publication, the body with HSE approval to operate and maintain a register of businesses who are members of a “class of persons” is CORGI. Therefore it is essential that all businesses or self employed gas installers are registered with CORGI.

Persons deemed competent to carry out gas work at premises covered by the Gas Safety (Installation and Use) Regulations [1] are those who hold a certificate of gas safety competence acceptable to CORGI which include (without limitation) the Accredited Certification Scheme (ACS) and the Gas Services S/NVQ that has been aligned to ACS.

Guidance on competence is given in HSC Approved Code of Practice and Guidance L56, Safety in the installation and use of gas systems and appliances [10].

Whilst it is a requirement under the Health and Safety at Work etc. Act [11] to be competent when designing or installing a chimney, except where the chimney is part of the appliance, there is no requirement to be CORGI registered for such work providing it does not involve any associated work on a gas appliance/fitting.

5 General

NOTE Design of chimneys for non-room-sealed appliances is specified in BS EN 15287-1:2008, Clause 4, and for room-sealed appliances in BS EN 15287-2:2008, Clause 4. BS EN 15287-1 and BS EN 15287-2 specify that chimneys should conform to nationally accepted rules. General UK requirements for design of chimneys for both room-sealed and non-room-sealed gas appliances are specified in 5.1 to 5.7.

5.1 Compatibility of appliances and chimneys**COMMENTARY ON 5.1**

The effectiveness of a chimney in discharging products of combustion to the outside air is dependent on the flue size (cross-section), length, route, exposure and the materials used in its construction. The effectiveness is also influenced by the thermal efficiency of the appliance and its usage pattern as well as being critically dependent on an adequate supply of combustion air.

For room-sealed appliances in which the chimney configuration is supplied with the appliance (referred to in BS EN 15287-2 as system chimneys), the manufacturer can be expected to have taken these factors into consideration in the integrated appliance and chimney configuration design.

For non-room-sealed (open-flued) appliances, calculations need to be carried out to determine the size of chimney required to ensure full clearance of combustion products. A calculation method for open flue chimneys is given in Annex B, alternatively the method given in BS EN 13384-1 may be used.

As the motive power generated by a fan is considerably greater than that generated thermally, fanned systems can be used with smaller flues than those required for corresponding non-fanned systems. This can have advantages in certain circumstances, for example it gives greater flexibility in the routing of the chimney and in the siting of the chimney outlet.

The chimney required for a specific situation will also be dependent on the proposed location of the appliance. In selecting the correct chimney, the following factors should be taken into account.

- a) *Constraints imposed on potential chimney outlet locations by the following:*
 - *openings into the building including windows, air bricks and other ventilation openings;*
 - *existing chimney outlets;*
 - *neighbouring properties;*
 - *boundaries;*
 - *combustible materials on the external face of the building;*
 - *structural and/or topographical features which might prevent a free flow of air over the chimney outlet and/or lead to adverse pressure zones;*
 - *the need to site low level terminals so as to avoid physical damage, e.g. from opening doors;*
 - *the need to guard low level terminals to protect passers by;*
 - *the effects of any plumbing on surfaces of the building and neighbouring properties.*
- b) *The availability of existing chimneys for re-uses.*
- c) *The function of the room in which the appliance is to be installed, particularly in the case of bathrooms, bedrooms and bed-sitting rooms where special rules apply under the Gas (Safety, Installation and Use) Regulations 1998 [1].*
- d) *The need for provision of an adequate air supply for combustion and (where necessary) cooling.*
- e) *The extent to which mechanical ventilation is present in the intended location and the effect that this might have on non-room-sealed appliances.*
- f) *In the case of fan assisted chimneys, if additional safeguards are required to ensure that the appliance is shut down on failure of the fan. (See Clause 7 for further information.)*

Attention is drawn to the Building Regulations [3], [4], [5], [6] and supporting documentation [12], [13] which require appliances and chimneys to be so constructed and installed as to reduce to a reasonable level the risk of people suffering burns or the building catching fire.

For buildings of timber framed construction, adequate safeguards can be achieved, for example, by the introduction of suitable sleeves or ducts where the chimney or chimney configuration passes adjacent to combustible material, or by other simple shielding arrangements. For such buildings, precautions are also necessary to preserve the integrity of any vapour barrier or cavity insulation and to minimize any effects on the thermal and acoustic insulation properties of the structure. Detailed arrangements can be found in the Institution of Gas Engineers and Managers Publication IGE/UP/7.

5.1.1 The appliance shall be connected to a chimney of a classification which is appropriate for the appliance type.

COMMENTARY ON 5.1.1

To ensure the safe and effective operation of an appliance and chimney it is essential that the appliance classification is compatible with the chimney designation. For room-sealed appliances it is common that the chimney configuration is certified and supplied by the appliance manufacturer. Certain appliances (e.g. Type C₂, Type C₄ and Type B₂) may be connected to a chimney supplied separately.

Gas appliances are classified in PD CEN/TR 1749:2005 according to the method of evacuation of the products of combustion as Type A (flueless) Type B (open-flued) and Type C (room-sealed). Type A appliances do not have a chimney and are outside the scope of this part of BS 5440. Chimneys are given a designation string in accordance with BS EN 1443 on the basis of their performance characteristics and the materials from which they are made. Details of these classification and designation systems are given in Annex A.

5.1.2 The appliance shall be connected to a compatible open flue chimney or room-sealed chimney configuration which is in accordance with:

- a) the appliance manufacturer's installation instructions (see **5.1.3**) or, if these do not specify the chimney to be used, the default values given in Table A.2; and
- b) the additional requirements for flueing specified in the following standards, as applicable:
 - 1) BS 5546 for water heaters;
 - 2) BS 5871-1 and BS 5871-2 for gas fires;
 - 3) BS 5871-3 for decorative fuel effect gas fires;
 - 4) BS 6798 for boilers;
 - 5) BS 5864 for ducted warm air heaters;
 - 6) BS 6230 for direct and indirect fired warm air heaters;
 - 7) BS 6896 for overhead radiant tubes and radiant plaques.

NOTE Detailed arrangements for flueing of gas appliances in timber framed and steel framed dwellings are given in the Institution of Gas Engineers and Managers publication IGE/UP/7.

5.1.3 New or used appliances shall not be connected unless the appliance manufacturer's installation instructions are available to the installer.

5.2 Chimney outlets

NOTE 1 Chimney terminals for non-room-sealed appliances are specified in BS EN 15287-1:2008, 4.3.31 and chimney terminals for room-sealed appliances are specified in BS EN 15287-2:2008, 4.3.26.

NOTE 2 The location of chimney outlets for non-room-sealed appliances is specified in BS EN 15287-1:2008, 4.3.18, and for room-sealed appliances in BS EN 15287-2:2008, 4.3.17. BS EN 15287-1 and BS EN 15287-2 specify that the location of chimney outlets should be in accordance with national rules. UK requirements for location of chimney outlets for gas appliances are specified in 5.2.1, 5.2.2 and 5.2.3.

5.2.1 General

Chimney outlets shall be located as specified in Annex C.

The chimney outlet shall not be obstructed. Any obstructions such as adjacent aerals, small wind turbines mounted on the chimney stacks or nearby and above the chimney outlet and trees shall be removed or the chimney outlet sited elsewhere.

COMMENTARY ON 5.2.1

The main function of a chimney for both non-room-sealed and room-sealed appliances is to effectively discharge the products of combustion to the outside air under all weather conditions. This is achieved by the selection of the correct terminal and the correct outlet location.

Openings in the terminal are sized to prevent the ingress of foreign matter which would seriously impair the performance of the flue system. Under certain conditions, pluming can occur at the outlet and, where possible, chimney outlet positions where this could cause a nuisance should be avoided.

Aerals, small wind turbines mounted on chimney stacks or nearby and above the chimney outlet, trees and other obstructions could impede the operation of the chimney.

5.2.2 Location of chimney outlets in relation to basement areas, light wells and retaining walls

Chimney outlets shall be sited so as not to discharge within the curtilage or confines of any enclosed basement area, light well or external space formed by a retaining wall or passage unless provision is made to ensure the safe dispersal of flue gases as follows.

- a) Chimney outlets from room-sealed appliances and fanned draught non-room-sealed appliances may be sited in such areas provided that they are sited not more than 1 m below the top level of the basement area, light well or retaining wall.
- b) Chimney outlets from room-sealed appliances and fanned draught non-room-sealed appliances may be sited in a basement area or light well where this is formed by a single retaining wall that creates an uncovered passageway at least 1.5 m wide. This shall only be done if the passage allows free air circulation beyond and around the ends of the structure and the retaining wall, if the passageway terminates at or above ground level and if unobstructed air movement can take place at the open ends of the passageway.

5.2.3 Terminal guards

COMMENTARY ON 5.2.3

Attention is drawn to the Building Regulations [3], [4], [5], [6] and supporting documentation [12], [13].

Terminal guards shall be used where there is a risk of blockage of, and/or damage to, the terminal and/or where there is a risk of injury to people including exposure to excessive temperatures.

NOTE Blockage of the terminal can be caused, for example, by nesting birds and other wildlife.

5.3 Chimneys for use with condensing appliances (open-flued and room-sealed)

5.3.1 General

COMMENTARY ON 5.3.1

Condensing appliances are normally of the fanned room-sealed type, although other types are not necessarily excluded. The manufacturer might specify the flue route, siting and terminal.

When installing a condensing appliance, extra provisions (compared to a non-condensing appliance) shall be made to accommodate the condensate by selecting and constructing the chimney of materials in accordance with 5.3.2, incorporating arrangements for condensate disposal in accordance with 5.3.3 and siting the chimney outlet in accordance with 5.3.4.

5.3.2 Chimney materials

The materials selected for chimney components and any sealing devices shall be suitable for use with condensed combustion products which are mildly acidic.

COMMENTARY ON 5.3.2

Materials such as copper, mild steel and certain grades of stainless steel are not suitable for this particular application. Where doubt exists, advice should be sought from the appliance manufacturer.

Plastics material should be used only where the appliance to be connected is CE marked and the manufacturer's installation instructions specifically permit and specify such flue system materials and constructions and detail the requirements for their use. In all other circumstances, advice should be sought from the manufacturer.

5.3.3 Condensate disposal

Where the appliance installation instructions specify that a condensate drain needs to be provided for the appliance, provision shall be made also for the collection and/or disposal of condensate formed in the flue.

Material, sizing and routing of the condensate drain shall be in accordance with the appliance manufacturer's instructions.

COMMENTARY ON 5.3.3

If the appliance installation instructions state that it is permissible, the chimney may be designed to conduct the condensate from the flue back to the appliance for disposal through the appliance's condensate drain. Alternatively or additionally, provision can be made to drain the chimney at any convenient point. Some appliances might combine the chimney and condensate drain as a single pipe.

In most circumstances a chimney drain pipe requires a trap to prevent flue products escaping, air from entering the flue, or smells from entering the premises.

Where the appliance input does not exceed 4 kW it might be acceptable to discharge the condensate other than to a drain provided that this is in accordance with the appliance manufacturer's instructions. Any combined chimney and condensate discharge pipe should project a minimum of 75 mm from the point of exit on an external wall and be sited such that condensate cannot drain onto a pathway where freezing of the condensate might cause a hazard.

Detailed advice on condensate drains for boilers is given in BS 6798 and for water heaters is given in BS 5546.

5.3.4 Siting of the flue duct outlet

5.3.4.1 General

The flue duct outlet shall be sited so that the wet combustion products are unlikely to cause damage or nuisance.

COMMENTARY ON 5.3.4.1

Appliances (particularly condensing appliances) have a tendency to form a plume of water vapour from the flue duct outlet. The effect of wind conditions and the dispersal of the plume relative to adjacent wall surfaces, openable windows and neighbouring property should be considered.

5.3.4.2 Proximity to a boundary

The flue duct outlet shall be sited in accordance with **C.3**.

5.4 Location of appliances

5.4.1 General

Location of appliances shall be in accordance with the appliance manufacturer's instructions.

COMMENTARY ON 5.4.1

Attention is drawn to Regulation 30 of the Gas Safety (Installation and Use) Regulations [1] with respect to installations in bedrooms, bathrooms or shower rooms and to instantaneous water heaters.

- An appliance, purchased second hand, without a "CE" mark is unlikely to be fitted with an appropriate safety control. Some appliances, purchased second hand, carrying the "CE" mark might not be fitted with an appropriate safety control.*
- Where there is any doubt as to whether the appliance is fitted with an acceptable safety control, it should not be installed, or be allowed to be used in sleeping accommodation.*
- The Gas Safety (Installation and Use) Regulations [1] require cupboards and compartments which have doors opening into bedrooms or bathrooms or shower rooms to be treated as part of the bedroom or bathroom or shower room concerned.*
- The Gas Safety (Installation and Use) Regulations [1] also require cupboards and compartments which have doors opening into other rooms or spaces, but are ventilated through adjoining walls, floors or ceilings into bathrooms or shower rooms or bedrooms, to be treated as part of the bedroom or bathroom or shower room concerned.*

5.4.2 Garages and other hazardous areas

Gas appliances and their chimneys in commercial repair workshops for motor vehicles shall be installed in accordance with the British Gas publication IM/28 [14].

Gas appliances shall not be installed in spaces classified as hazardous as defined in BS EN 60079-10:2003.

COMMENTARY ON 5.4.2

The requirement for commercial workshops is intended to apply where petroleum and other heavier than air flammable vapours are present. Wherever reasonably practicable, appliances should not be installed in such places.

Since the Gas Safety (Installation and Use) Regulations 1998 [1] came into force, there is no longer any specific restriction under the on the type of chimney or location of appliances that may be installed in a private garage.

5.5 Passive stack ventilation

COMMENTARY ON 5.5

In order to avoid the outlets for a passive stack ventilation system and a chimney being positioned in different pressure zones, both the outlets should be located on the same face of the building, and the chimney outlet should be at the same or at a higher level than the passive stack ventilation outlet.

Where a building contains both passive stack ventilation systems and open-flued natural draught appliances, the respective chimney outlets shall be sited so as to avoid the possibility of setting up a pressure gradient across the two systems that could lead to appliance flue reversal.

5.6 Exchange of information and planning

The designer or installer of the chimney, and the provider or installer of the gas appliance shall agree and document the pertinent compatibility details (see 5.1) with the customer as appropriate. Where the chimney is provided as part of the appliance, e.g. a room-sealed configuration (including balanced flue) appliance, the installer shall agree and document, with the customer, that the chimney configuration is suitable for the application.

COMMENTARY ON 5.6

When erecting a new chimney or chimney configuration or modifying an existing one, the pertinent details include the type, size and route of the chimney and the type and size of gas appliance that is intended to be connected to it. This is particularly pertinent when different trades are involved in the erection of the chimney or chimney configuration and fitting the gas appliance.

When a gas appliance is to be fitted to an existing open flue chimney or room-sealed chimney configuration, it is essential that the installer confirms that the chimney is suitable for the appliance.

Where appropriate, the end user (customer), should be consulted and involved in the decision making process. The customer should be advised of the reasons for the choice of appliance and the flueing option. Some factors that might be relevant, such as cost, aesthetic appearance, and positioning relative to furniture, fittings and the building structure, are beyond the scope of this standard. However, the choice of an open-flued or room-sealed appliance might be influenced by attitudes to safety issues.

All appliances converting energy into useful heat (i.e. electrical and fossil fuel-fired appliances) might invoke some element of risk. Incidents involving gas utilization generally involve inadequate installation, subsequent lack of servicing or maintenance or misuse by the user.

Burning any fossil fuel (oil, solid fuel and gas) creates products of combustion which could lead to the creation of harmful elements if the combustion process and subsequent provisions for flueing are inadequate.

Open flue chimneys do not operate correctly under conditions of inadequate or blocked flues, or inadequate or blocked air supply and under such conditions may spill products of combustion.

New appliances installed in domestic applications are required by the Gas Appliances (Safety) Regulations [7], to be marked with the CE mark and have devices fitted that are designed to shut down the appliance before there is a dangerous build up of the products of combustion in the room.

Some used appliances might not be fitted with such devices if they were manufactured before this became a mandatory requirement.

Some commercial appliances might not require such devices if they are installed in commercial situations.

Attention is drawn to chimney plates, which may be available to assist in matching the appliance to the chimney or chimney configuration (see also 6.1.1). Attention is drawn to the Building Regulations [3], [4], [5], [6].

5.7 Maintenance

The responsible person shall be advised that, for continued efficient and safe operation of the appliance and its chimney, it is important that adequate and regular maintenance is carried out by a competent person (i.e. a CORGI-registered gas installer) in accordance with the appliance manufacturer's recommendations.

COMMENTARY ON 5.7

The Gas Safety (Installation and Use) Regulations [1] impose a general obligation on landlords providing gas appliances in tenanted premises to have these maintained in a safe condition and checked for safety every 12 months.

Where an independently mounted carbon monoxide (CO) detector to BS 7927 or BS EN 50379-3 is fitted in or recommended for a room containing a gas appliance the installer should advise the user that a detector should not be regarded as a substitute for proper installation and regular servicing by a competent person.

Where any defects that cannot be rectified are identified as part of any maintenance or safety check activity, reference should be made to the requirements of the Gas Industry Unsafe Situations Procedure [15].

6 Individual open-flued natural draught Types B₁₁, B₁₂, B₁₃ appliances

6.1 Design

6.1.1 General

COMMENTARY ON 6.1.1

Attention is drawn to the Building Regulations [3], [4], [5], [6], supporting documentation [12], [13] and additional guidance (DFP Technical Booklet Part L: 2006 [16] and Scottish Building Regulations Handbook, Domestic, section 3.17–3.21 [17]) that specify a chimney plate which is to be fixed to the building to advise appliance installers of the characteristics of the chimney. Installers should establish that the chimney and any hearth are suitable for the appliance and the chimney plate is intended to assist in this respect.

Any new chimney specified for installing an open-flued gas appliance shall be designed in accordance with BS EN 15287-1 and shall have a classification that is allowed by the appliance manufacturer. Default classifications are given in Annex A. For the UK, the materials to be specified are summarized in 6.1.2 and 6.1.3. The chimneys shall be routed and sized as specified in 6.1.4 and terminated as specified in 6.1.6 and 6.1.7.

Any existing chimney shall conform to 6.1.7. Each flue shall only communicate with the room or space in which the appliance is installed.

Asbestos materials shall not be used for new chimneys (for existing chimneys see 6.1.7).

6.1.2 Selection of chimneys

COMMENTARY ON 6.1.2

Attention is drawn to the Building Regulations [3], [4], [5], [6] and supporting documentation [12], [13] for relining of flues. In the case of new masonry chimneys, it should be noted that poured concrete linings are not acceptable as a method of lining a chimney.

New chimneys shall be either:

- a) of brick or other masonry construction and lined with one of the following:
 - 1) clay flue liners conforming to BS EN 1457; or
 - 2) concrete flue liners conforming to BS EN 1857.
- b) constructed of flue blocks (see Annex D) conforming to:
 - 1) BS EN 1806 (clay); or
 - 2) BS EN 1858 (concrete).
- c) factory-made insulated metal chimneys conforming to BS EN 1856-1. Single walled metal chimneys shall not be used externally except as specified in 6.1.6. Where metal chimneys are to be used externally, they shall be double walled insulated metal chimneys as specified in BS EN 1856-1 installed in accordance with the chimney manufacturer's instructions.

NOTE New chimneys can be classified as either:

- system chimneys; or
- custom-built chimneys.

6.1.3 Connecting flue pipes and flue boxes

Connecting flue pipes between an appliance and the chimney shall conform to BS EN 1856-2.

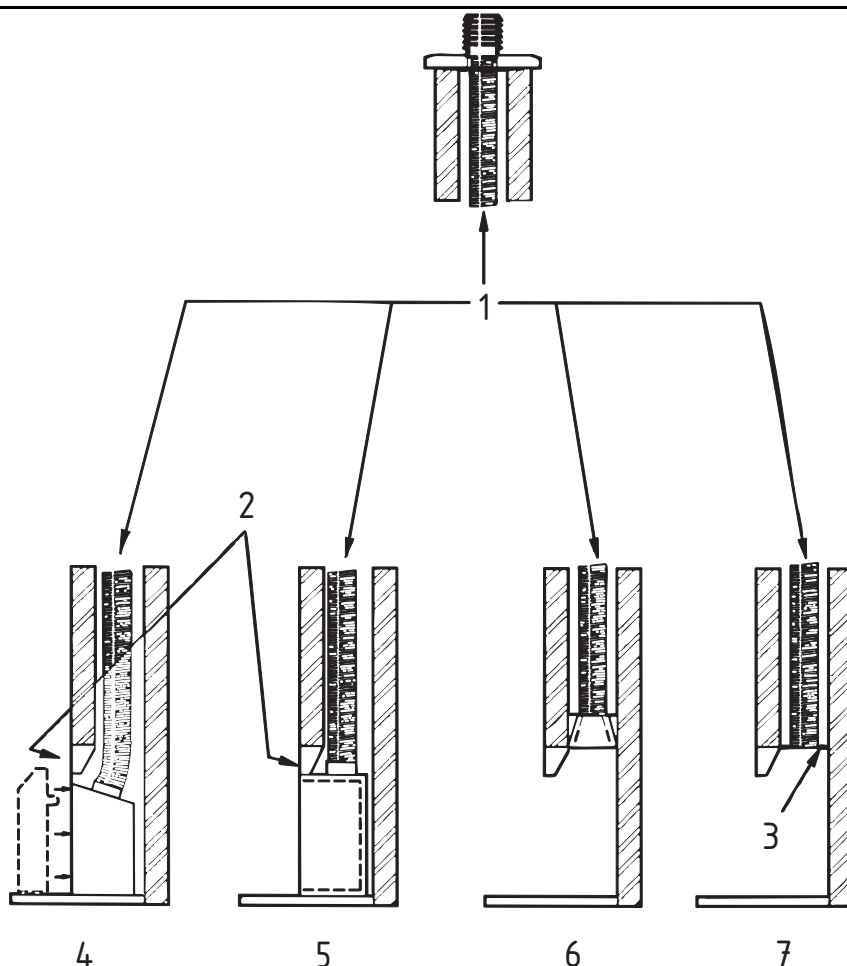
Sheet metal flue boxes shall conform to BS 715. A flue box shall only be used to accommodate a fire where it has been identified as being suitable for such use by the appliance manufacturer and/or the flue box manufacturer.

COMMENTARY ON 6.1.3

Proprietary prefabricated flue boxes conforming to BS 715 may be used in conjunction with metal chimneys conforming to BS EN 1856-1 or BS EN 1856-2. Technical data and installation instructions will be provided with such boxes.

Methods of installation using a flue box, metal chimney or flexible liner within a masonry chimney are shown in Figure 1, Figure 2, Figure 3 and Figure 7. It should be noted that flue boxes are not suitable for solid fuel appliances, and this should be stated (via a permanent badge/label) on the flue box.

Figure 1 Typical methods of using a flue liner in a masonry chimney installation serving a gas appliance, other than a back boiler



Key

- | | |
|--|---|
| 1 Flue liner conforming to BS EN 1856-2 | 5 Flue liner conforming to BS EN 1856-2 connected to a gas flue box conforming to BS 715 |
| 2 Joints to be well made where the closure plate or the flue box is sealed to the face of the opening or fire surround | 6 Flue liner secured and sealed into a proprietary gather above the builder's opening |
| 3 Debris or register plate | 7 Flue liner mechanically secured and sealed with a clamp to a debris or register plate above a builder's opening |
| 4 Flue liner connected to a proprietary flue gas collector. For use with an appliance with a closure plate | <i>NOTE The liner should not project below the plate more than a nominal 25 mm</i> |

NOTE 1 If the gas supply to the appliance is to be made through the wall of the gas flue box, it should be routed as close as practicable to the bottom of the box and sealed into the box with a non-setting sealant.

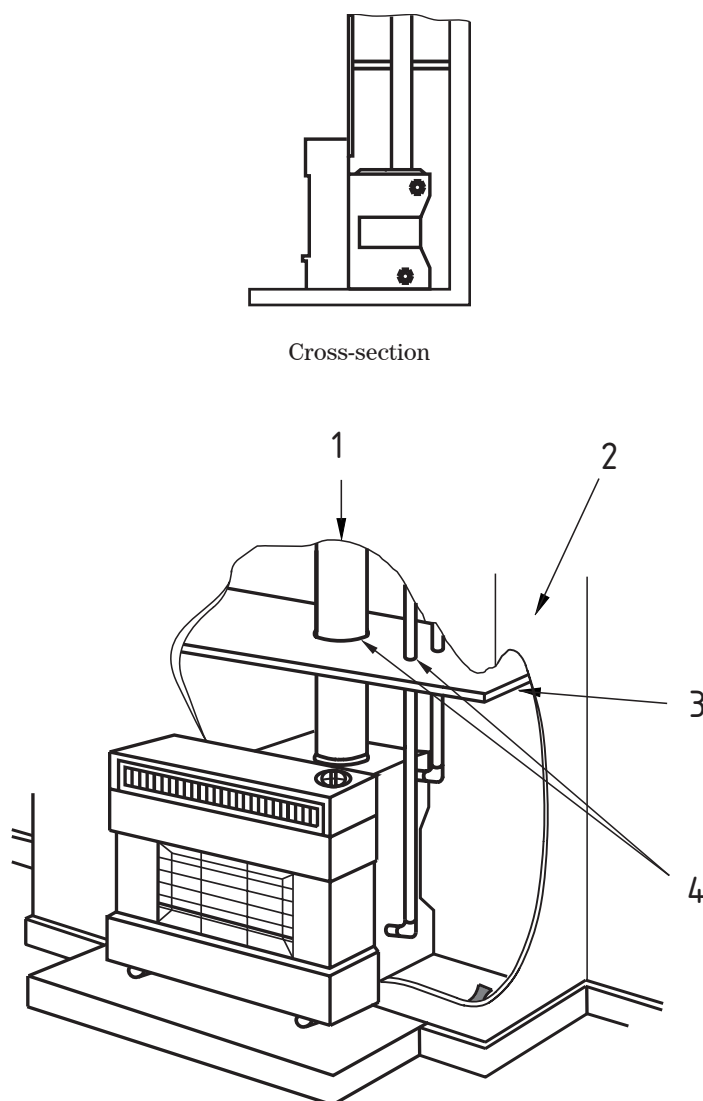
NOTE 2 The flexible liner should rise in one continuous length as near vertically as possible from the top of the appliance, gas flue box or fireplace recess and no part of the flue liner should form an angle greater than 45° from the vertical.

NOTE 3 The flexible liner should be installed in accordance with the appliance manufacturer's instructions and be mechanically secured and sealed at the top of the chimney. Care should be taken to ensure that any materials used to seal and close off and seal the liner at the top of the chimney, do not drop down the void around the outside of the liner.

NOTE 4 An approved terminal should be used to protect the end of the flue where its diameter is less than 170 mm.

NOTE 5 In each of the illustrations above, the requirements are the same if a fire surround is applied to the front of the opening.

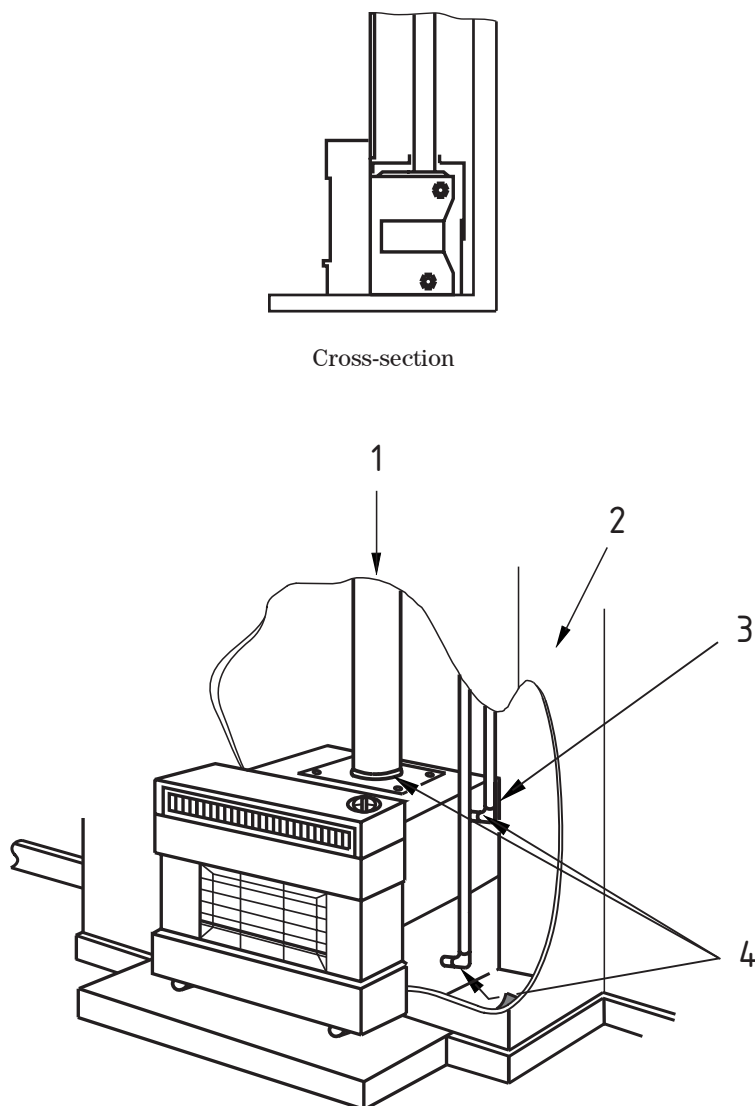
Figure 2 Installation of a gas fire and combined back boiler using a back boiler enclosure and prefabricated chimney: enclosure arrangement using a false chimney breast and closure panel



Key

- | | |
|---|--|
| 1 Chimney installed according to manufacturer's installation instructions | 3 Seal off all edges of the closure panel where it meets all four walls of the false chimney breast |
| 2 False chimney breast | 4 Seal any holes where the flue system and/or the plumbing connections pass through the closure panel. |

Figure 3 Installation of a gas fire and combined back boiler using a back boiler enclosure and prefabricated chimney: enclosure arrangement using a proprietary back boiler box



Key

- | | |
|---|---|
| 1 Chimney installed according to manufacturer's installation instructions | 3 Assemble and seal the box in accordance with the manufacturer's installation instructions |
| 2 False chimney breast | 4 Seal any holes made through the enclosure for connecting pipework and flue system |

NOTE If the gas supply to the appliance is to be made through the wall of the back boiler box, it should be located as close as practicable to the bottom of the box and be sealed into the box with a non-setting sealant.

6.1.4 Routing and sizing

The chimney shall be routed and sized to ensure full clearance of combustion products. A minimum of 600 mm of vertical chimney directly above the draught diverter shall be provided unless otherwise stated in the appliance manufacturer's instructions.

The chimney shall, where practicable, take a vertical, internal route consistent with structural stability, appearance and possible chimney outlet position. Where vertical sections are not practicable, these shall be as short as possible and form an angle no greater than 45° to the vertical except for a connecting flue pipe which connects the appliance directly to the chimney base (see **6.1.3**).

Where it is necessary for a metal chimney to be run outside the structure of the building, an insulated metal chimney conforming to BS EN 1856-1 shall be used (see **6.1.6**).

The minimum cross-sectional area of flues for appliances other than gas fires shall be not less than the area of the flue spigot.

New chimneys for gas fires shall have a minimum circular cross-sectional area of 12 000 mm² unless otherwise stated in appliance manufacturer's instructions. For new chimneys constructed with gas flue blocks, the minimum cross-sectional area shall not be less than 16 500 mm² with no dimension less than 90 mm.

The following appliances shall not be connected to flue blocks having a cross-sectional area between 12 000 mm² and 13 000 mm² or having a minor dimension of 63 mm or less:

- a) drying cabinets;
- b) appliances having a flue duct outlet area greater than 13 000 mm²;
- c) gas fires and combined appliances incorporating a gas fire unless a special starter block/adaptor has been designed for the purpose, tested and supplied by the appliance manufacturer or the appliance manufacturer's instructions specifically state that this is acceptable.

NOTE Some appliance manufacturers' instructions state that they are not suitable for connection to flue blocks of certain sizes, e.g. constructed to BS 1289:1975 which allowed flue blocks with a minimum dimension of 63 mm, whereas BS 1289-1:1986 had increased this minimum dimension to 90 mm.

COMMENTARY ON 6.1.4

An essentially vertical route from the draught diverter, if fitted, is recommended. Exceptions to this might be permitted in, for example:

- a) *chimneys, constructed in buildings other than single storey, and/or where calculations using Annex B indicate likely clearance of combustion products and subsequent commissioning tests prove satisfactory; or*
- b) *gas heating stoves where the appliance manufacturer's instructions specify that a section of the flue is horizontal; or*
- c) *modular boilers incorporated into a fully integrated scheme.*

NOTE Particular care should be taken with appliances installed on single storey chimneys, due to their short flue length.

To provide protection against problems associated with down-draught on steeply pitched roofs, it is recommended that the route of the chimney leads to an outlet at the highest point of the roof (e.g. at or near to the ridge) rather than on the slope of the roof.

Chimneys constructed of flue blocks may be designed either:

- 1) *for bonding into and forming an integral part of the building structure (in which case they are mainly in new premises); or*
- 2) *for adding-on to either a new or existing building.*

It should be noted that rectangular gas flue blocks are generally more resistive to flow than are circular metal chimneys of the same cross-sectional area. Not all appliances are suitable for connection to gas flue blocks. The appliance manufacturer's instructions should be consulted in this regard.

Changes in appliance design mean that a chimney that has performed adequately with an existing appliance cannot be assumed to be satisfactory for a replacement appliance of the same type.

Annex B describes a method of assessing whether a chimney is likely to give a satisfactory performance and is based on the concept of the equivalent vertical height of the flue. Annex B also refers to effective height since this is the term used in the installation instruction for some gas fires. Gas fire/back boiler units require a minimum vertical height of 3 m and this is the minimum effective height to be used in calculations.

Long external flue runs should be avoided, particularly from appliances fitted in cellars and basements. Whenever possible, chimneys should be routed inside the premises to ensure that the internal length exceeds the exposed external length.

6.1.5 Chimney outlets

6.1.5.1 General positioning

For all new installations and whenever an existing appliance is replaced, the chimney outlet location shall be in accordance with **C.1**, except in those circumstances specified in **6.1.5.2**.

COMMENTARY ON 6.1.5.1

Where there is evidence that a chimney is used by nesting birds, squirrels or other wild life or there is such a known problem in the neighbourhood, a suitable guard or terminal should be fitted to the chimney to prevent entry. This is particularly important in areas where birds such as jackdaws are known to roost. Before fitting a terminal or guard the chimney should be inspected, and where necessary reinforced, to ensure that it can support such a terminal or guard. After fitting a terminal guard, the appliance should be checked for spillage to ensure that the products of combustion are being cleared.

6.1.5.2 Adjacent structures

COMMENTARY ON 6.1.5.2

Where the horizontal distance between the chimney and a structure on a flat roof exceeds 1.5 m and is greater than ten times the height of that structure above the point where the chimney passes through the roof, then that structure can be discounted as having any effect on the performance of that chimney (see Figure C.4).

Where there are adjacent vertical structures which might affect the performance of a chimney above a flat roof, the height of the chimney outlet shall not be less than 600 mm measured above a line joining the neighbouring high points where it crosses the central axis of the flue (see Figure C.5). If more than two separate structures are sited on the roof the condition resulting in the highest chimney outlet shall be employed.

The base of any chimney outlet serving an open-flued appliance shall be at least 600 mm vertically above a line passing through the highest part of an adjacent higher structure and the edge of a lower structure where the lower structure is 10 m or less from the higher structure. It shall not be within 2.3 m measured horizontally from the highest part of the structure (i.e. within the envelope shown in Figure C.5).

6.1.6 Condensation

Unless the chimney has been designed for wet applications, i.e. to resist condensation, the following steps shall be taken to maintain the flue gases at their maximum temperature to avoid problems of excessive condensation, forming in the chimney.

- a) Gas appliances shall not be installed on single wall chimneys which are routed externally, except for the protrusion above a roof line, since this increases the likelihood of condensation occurring, particularly on cold start up of the appliance.
- b) Gas appliances shall not be installed on metal twin walled chimneys which have only an air gap for insulation and have external lengths in excess of 3 m.
- c) Where prolonged condensation cannot be avoided, only flue liner and jointing materials classified as suitable for wet applications (contains W in the designation string) shall be used, and provision shall be made for the collection and disposal of the condensate from the chimney.

COMMENTARY ON 6.1.6

With the increasing efficiency of gas-fired appliances, flue gas temperatures are likely to be lower and chimneys more vulnerable to condensation. Steps should be taken to ensure that new chimneys are routed internally in the building. Where this cannot be achieved, insulated chimneys with a minimum resistivity of $R 22$ (i.e. $0.22 \text{ m}^2 \cdot \text{K/W}$) of insulation should be used externally, where condensation is to be expected for high efficiency appliances.

Heavy condensation in a poured in situ concrete lined chimneys previously used with another fuel, might cause the liner to spall. If condensation is predicted in such a liner, an additional flexible flue liner should be installed of a size suitable for the intended purpose. Also see 6.1.2.

Means of avoiding condensation include:

- a) *in the case of a brick chimney, lining the chimney with a flexible chimney liner conforming to BS EN 1856-2 approved for wet applications (W), see 6.1.6c);*
- b) *using a chimney having a lower heat loss such as a double wall metal chimney conforming to BS EN 1856-1.*

Where condensation cannot be avoided then a chimney should be chosen that can incorporate sealed joints, to prevent condensation leaking out through the joints. In such cases provision should be made for the collection and disposal of condensate from the lowest section of the base of the vertical section of the chimney in accordance with the chimney manufacturer's instructions.

Specific requirements for condensing appliances are specified in 6.1.6.

Table 1 and Figure 4a) and Figure 4b) give the maximum flue lengths for which problems with condensation during normal winter conditions are unlikely. Table 1 is for gas fires of net efficiency not greater than 77%, and Figure 4a) and Figure 4b) are for other types of appliance of net efficiency not greater than 88%.

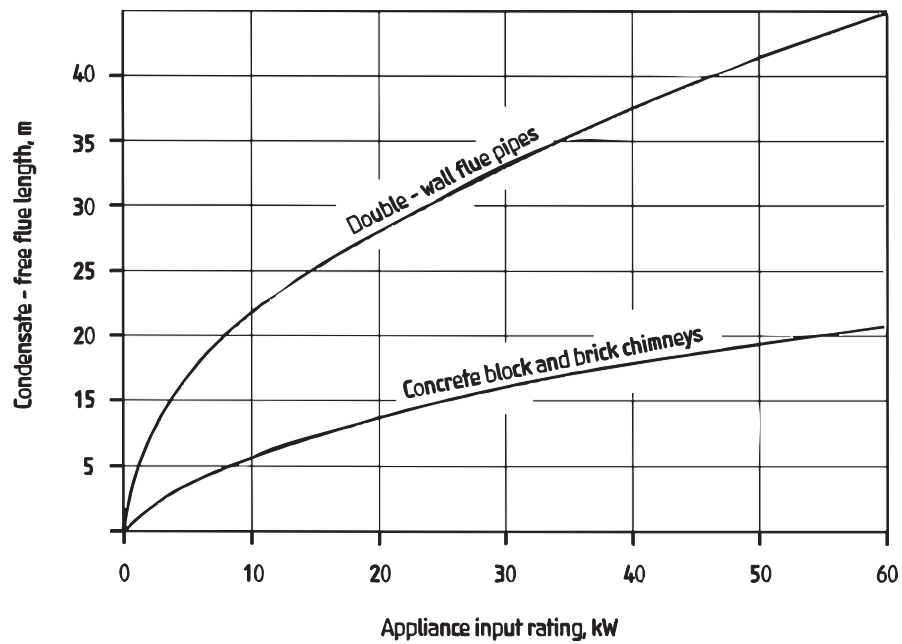
Table 1 Condensate-free lengths of individual open flue used with a gas fire

Flue exposure	Condensate-free length		
	225 mm × 225 mm brick chimney: pre-cast concrete block flue of area 13 000 mm ² and aspect ratio of up to 4:1 or area 20 000 mm ² and aspect ratio ^{B)} of up to 5:1	125 mm diameter metal chimney	
		Single wall mm	Double wall mm
Internal ^{A)}	12	20	33
External	10	Not allowed	28

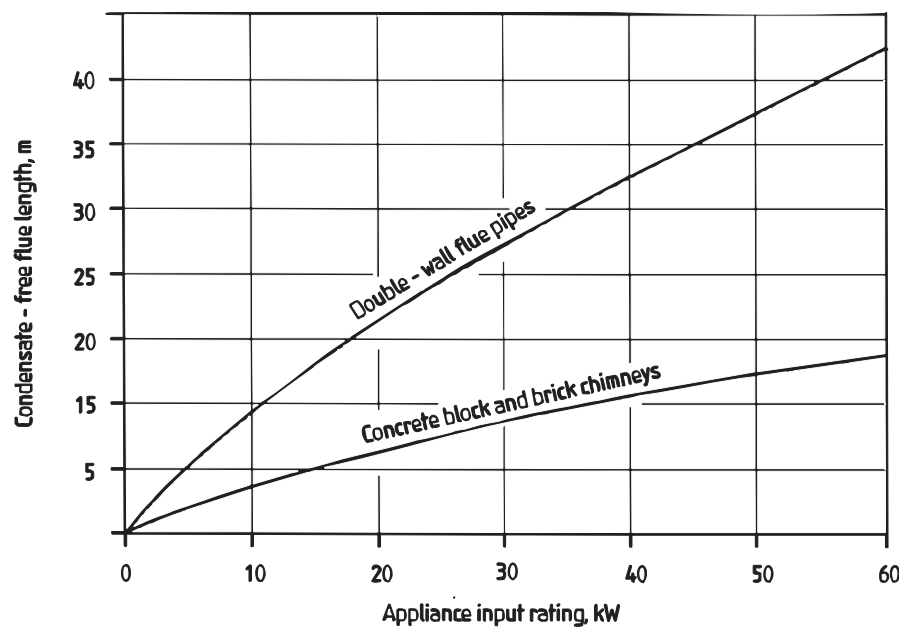
^{A)} An internal chimney is one of which the only surfaces exposed to external temperatures are those of that length of chimney above the roof, and that length should not exceed 1.5 m unsupported or one quarter of the flue height, whichever is the shorter.

^{B)} Aspect ratio means ratio of width to depth measured in a horizontal plane.

Figure 4 Maximum lengths for condensate-free chimneys for appliances other than gas fires



a) Internal flues



b) External flues

6.1.7 Existing chimneys

6.1.7.1 Suitability and adoption

Any existing chimney which is to be used shall conform to the requirements of **6.1** or the equivalent requirements of these clauses in earlier British Standards, for example BS 5440-1:2000³⁾, and be fit for the purpose intended and be of sound construction. Where such a chimney is known to have given unsatisfactory performance with a previous appliance or fuel, it shall be examined and any faults rectified and, if necessary, in the case of a masonry or unlined brick chimney, the chimney shall be lined.

Where it is suspected that an existing chimney or chimney component (e.g. connecting flue pipe) contains asbestos, a risk assessment shall be conducted prior to carrying out any work.

An existing asbestos chimney or chimney component shall only be re-used if it is sound and does not require cutting or machining.

NOTE Attention is drawn to the Asbestos (Prohibition) Regulations [18].

COMMENTARY ON 6.1.7.1

In seeking to ascertain whether an existing chimney conforms to this British Standard it is advisable to check the following.

- a) *The route of the chimney, in order to establish whether there are any changes of direction which might adversely affect the performance of the chimney or result in blockage.*
- b) *The existence of other connections.*
- c) *The terminal should be examined and replaced as necessary (see 6.1.5). It is particularly important to ensure that the chimney has not been closed over or otherwise modified.*
- d) *The condition of the chimney to ensure that it is sound. If unlined, the inner surface is not showing signs of deterioration such as loose mortar or parging.*
- e) *Faults to be considered for rectification should include chimney flaunching, damp-proof course at roof level, brick pointing and terminal integrity.*

Where a gas fire is connected to an unlined brick chimney having a flue size greater than 170 mm it is generally unnecessary for the chimney terminal (pot) to be replaced, or for a terminal to be fitted. Bird guards should be fitted where necessary.

If the chimney terminal (pot) is removed and it is intended to slab over the chimney and continue to use the chimney, by providing side outlets, then an area of at least 12 000 mm² per flue on each of the opposite sides should be provided in accordance with the dimensional requirements for non-proprietary terminals in 6.1.5.

The outlets should be suitably protected to prevent bird entry.

Suitable checks for existing chimneys are specified in 6.3.2.

If an existing chimney is to be used, whether internal or external to the building, its fixings and stability should be checked, joints inspected and made good where necessary.

³⁾ Withdrawn on publication of BS 5440-1:2008.

A pre-cast flue block chimney designed for use with gas appliances may continue to be used when a fire or fire back boiler combination is to be replaced, but only if the replacement appliance manufacturer's installation instructions specifically state that the new appliance(s) is (are) suitable for such flue block chimneys and the flue size they provide which should be free of any protrusions of jointing material or mortar. It is essential, that care is taken to ascertain that no spillage occurs from any new appliance since it is possible that a previous appliance showed no signs of spillage since it was more tolerant in respect of chimney requirements than the replacement.

Any connecting flue pipe which connects the appliance directly to the chimney base, e.g. into the gasholder from a larger fireplace recess [see Figure 5b)], should be protected from debris by projecting it above the inside base of the chimney by not less than 250 mm and by fitting it with a deflector not less than one pipe diameter above the top of the connecting flue pipe, or a 90° bend. There should be a clearance of not less than 75 mm between the deflector or outlet of the bend and the wall of the gasholder. Where the appliance is connected into a gas flue block chimney, this should be by a suitable starter unit (see Figure D.1).

6.1.7.2 Obstructions, connections, sweeping and sealing

Any register plates, restrictor plates or dampers shall be removed or permanently secured in the open position to leave the main part of the flue unobstructed.

Under-grate air ducts shall be closed and permanently sealed.

The appliance shall be connected directly into the chimney and not via any existing fuel burning appliance.

The chimney shall be swept unless the previous appliance was a gas appliance.

Only one gas appliance shall be connected to a chimney unless the chimney is specifically designed to be shared (see Clause 8). Any other openings, e.g. vents and soot box doors, shall be permanently sealed with materials no less substantial than those of which the chimney is constructed.

Where the appliance is not fitted at the bottom of the chimney, that portion of the chimney below the appliance shall be sealed at a position not less than 250 mm and not more than 1 m below the point of connection and means shall be provided which enable debris to be removed (see Figure 5).

COMMENTARY ON 6.1.7.2

When fitting any new appliance to an existing chimney, consideration should be given to sweeping the chimney.

The following factors determine whether to sweep the chimney.

- a) *If the immediately previous use of the chimney has been for a solid fuel appliance, the chimney might have accumulated soot deposits which could be corrosive to any proposed metal liner; or be causing some blockage, and the chimney should be swept. Where a gas appliance has been used previously, this is less likely.*
- b) *All existing chimneys, irrespective of the fuel used, might have been constructed without a properly clear flue or, especially if they have been out of service for a long period of time, might have become obstructed by wildlife, bird's nests, spider's webs, etc., Sweeping is one way of ensuring an unobstructed flue. It might not reveal any holes, lack of integrity or discontinuities in the chimney.*

The effects of other chimneys in the same room (including through lounges) should be considered. Where there is more than one gas appliance the heat output of both appliances should be similar and their chimneys should terminate at the same height, preferably close together so that they are subjected to the same wind conditions.

6.1.7.3 Fitting an appliance to an unlined chimney

Where an appliance is fitted to an unlined brick chimney the methods of connection to the chimney shall minimize the entry of debris into the appliance flue spigot or connecting flue pipe (see Figure 5).

Where a gas fire is to be fitted into a fireplace recess and the chimney is not lined, the space shall be readily accessible for clearance of debris, for example by removal of the gas fire and closure plate.

Where an appliance is connected to an existing chimney and the chimney is not lined, a void below the point of connection, or, in the case of a gas fire, below the appliance spigot, shall be provided as specified in Table 2.

Provision shall be made for the inspection and removal of debris from the void, e.g. by providing an access plate or by removal of the appliance.

6.1.7.4 Lining

Unlined brick chimneys with a flue length greater than that given in Table 3 for the appropriate appliance shall be lined.

Where an existing chimney or flue is lined with a flexible liner, the liner shall be examined by a competent person (see Clause 4) for signs of deterioration and replaced where necessary or if there is any doubt about its integrity.

The annular space between the liner and the chimney shall be sealed at the base and at the top of the chimney (see Figure 1). At the base this shall be done in such a way that the sealant cannot fall out. The flue liner shall be supported at the top of the chimney.

For back boilers, where an existing chimney has been lined during construction, e.g. with a clay or concrete lining, a short length of either rigid or flexible flue pipe of size appropriate for the back boiler flue duct outlet shall be used to connect the appliance to the chimney liner. The annular space between the short length of connecting flue pipe and the chimney liner shall be sealed using a suitable jointing material, in such a way that it does not restrict the connecting flue pipe exit and cannot fall out into the back boiler enclosure.

Where gas appliances are to be installed to chimneys using a cast in situ concrete lining system, the system shall be suitable for the intended purpose.

NOTE 1 Some suitable methods are identified in the HETAS document "The official guide to approved solid fuel products and services" [19] which lists cast in situ concrete re-lining systems suitable for solid fuel. HETAS listing requires that a cast in situ re-lining system meets with appropriate clauses of BS EN 1857:2003 at the level T400 N2 D3 G and that the materials are specified, prepared and installed in accordance with an independently approved and monitored Code of Practice. These systems are also suitable for use with gas appliances.

NOTE 2 Attention is drawn to Approved Document J [13] to the Building Regulations [3] which permits the use of cast in situ concrete lining systems to be installed in existing chimneys, providing they are installed by a method which has been independently certified as being suitable for the intended purpose.

COMMENTARY ON 6.1.7.4

Where an unlined chimney is to be lined with a flexible flue liner, the condition of the chimney should be checked for soundness and swept if necessary. Where the chimney has been previously used for solid fuel, it should be swept to remove any obstructions or deposits that might be corrosive to the liner.

When replacing an existing appliance connected to a chimney lined with a metallic liner, the existing liner should be replaced unless it is considered that it can continue to operate safely throughout the life span of the new appliance.

Under normal operating conditions, a correctly installed metallic liner conforming to BS 715:1989⁴⁾ or BS 715:1993⁴⁾ or BS EN 1856-2 should operate safely for at least the operational life span of an appliance, normally 10 years to 15 years.

An existing chimney may be lined with a flexible liner in order to render that chimney fit for use, even if the appliance to be fitted does not otherwise require the chimney to be lined.

The support at the top of a liner can be made by means of a sealing plate or other suitable means. A typical way of sealing the annular space between the chimney and the flexible flue liner would be by the use of mineral wool. For larger openings, it might be necessary to use, for example, a register plate to hold the mineral wool in place. The advice given by the liner manufacturer regarding installation should be followed, particularly in relation to the location of the liner where it passes around bends in the chimney.

Further advice is given in BS 5871-1 and BS 5871-2.

Other flue lining systems and methods of application may be used which have been independently certified as suitable for the intended purpose.

Table 2 Minimum void dimensions required below appliance connections

Circumstances	Depth mm	Volume m³
Any appliance fitted to an unlined brick chimney	250	0.012 (12 litres)
Any appliance fitted to a lined brick chimney (new or unused, or used with gas)	75	0.002 (2 litres)
Any appliance fitted to a lined brick chimney (previously used with solid fuel or oil)	250	0.012 (12 litres)
Any appliance fitted to flue block chimney/metal chimney (new or unused, or previously used with gas)	75	0.002 (2 litres)
Any appliance fitted to flue block chimney/metal chimney (previously used with solid fuel or oil)	250	0.012 (12 litres)

⁴⁾ This edition of BS 715 is withdrawn.