BRITISH STANDARD

BS 8303-3: 1994

Installation of domestic heating and cooking appliances burning solid mineral fuels —

Part 3: Recommendations for design and on site installation

IMPORTANT NOTE. Before reading this Part it is essential to read BS 8303-1: *Specification for the design of installations* and BS 8303-2: *Specification for installing and commissioning on-site*, issued separately.

Confirmed December 2011

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Engineering Sector Board to Technical Committee RHE/28, upon which the following bodies were represented:

Association of British Solid Fuel Appliance Manufacturers
British Ceramic Tile Council
British Coal Corporation
Consumer Policy Committee of BSI
Department of Energy (Energy Efficiency Office)
Department of the Environment
HETAS Ltd.
Incorporated Association of Architects and Surveyors
Low Temperature Coal Distillers of Great Britain Ltd.
METCOM
National Fireplace Manufacturers' Association
National Society for Clean Air
Real Fire Association
Solid Smokeless Fuels Federation
Waterheater Manufacturers' Association
Coopted members

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Contents

Foreword

This Part of BS 8303 has been prepared under the direction of the Engineering Sector Board and together with BS 8303-1 and BS 8303-2 supersedes BS 8303:1986 which is withdrawn.

BS 8303 covers the installation of domestic heating and cooking appliances burning solid mineral fuel.

BS 8303-1 details the design specification to be followed by the installation designer, when developing an acceptable appliance installation design for the particular application.

BS 8303 specifies the practices to be followed when installing the appliance in accordance with the design specification. It reflects good site supervision and working practices.

This Part of BS 8303 gives guidance to the designer and installer on options to be identified and the methods of achieving a safe and satisfactory installation.

BS 8303 does not deal with design or installation of hot water heating systems or hot water supply systems. However, where the appliance involves hot water services, attention is drawn to BS 5449:1990.

Attention is drawn to the need to ensure compliance with all local and general regulations as they affect the installation, including the following:

— planning permission;

— Building Regulations [1];

— Clean Air Act [2];

— Gas Safety (Installation and Use) Regulations [3].

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 10, an inside back cover and a back cover.

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

1 Scope

This Part of BS 8303 gives guidance and recommendations on the design and installation of domestic heating and cooking appliances burning solid mineral fuels designed in accordance with BS 8303-1:1994 and installed in accordance with BS 8303-2:1994.

2 Definitions

For the purposes of this Part of BS 8303, the definitions given in BS 1846-1:1994 apply.

3 References

3.1 Normative references

This Part of BS 8303 incorporates, by dated or undated reference, provisions from other publications. These normative references are made at the appropriate places in the text and the cited publications are listed on the inside back cover. For dated references, only the edition cited applies; any subsequent amendments to or revisions of the cited publication apply to this Part of BS 8303 only when incorporated in it by amendment or revision. For undated references, the latest edition applies, together with any amendments.

3.2 Informative references

This Part of BS 8303 refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest editions.

4 Chimney connection for free standing appliances

Where a freestanding appliance is to be installed without the use of a fireplace recess no part of the chimney should be supported by the appliance. This is neccessary so that if an appliance needs to be removed for any reason it can be achieved without major disturbance to the chimney.

Masonry chimneys can be built up from ground level, a fireplace recess or part of the wall structure of the building. The connection between the appliance and the chimney is achieved via a flue pipe entry either vertically from underneath [Figure 1 a)] or into an opening in the side of the flue [Figure 1 b) or Figure 1 c)]. A factory made chimney is commonly supported on ceiling joists. In this case care should be taken that the length of chimney below the lowest support is correctly secured to the section above it and not allowed to rest on the appliance or any flue pipe.

5 Securing an appliance

The appliance should be secured to prevent movement which could cause joint separation at the flue pipe or chimney connection, and for open fires, at the hearth and fire surround. Joint separation could result in leakage of air into the flue or allow combustion products to escape into the building.

Securing is particularly important where an appliance relies for its connection to the flue on a seal between the appliance and the fireplace recess to prevent any leakage. Movement of the appliance can occur for a variety of reasons such as vigorous operation of the de-ashing mechanism or thermal expansion and contraction.

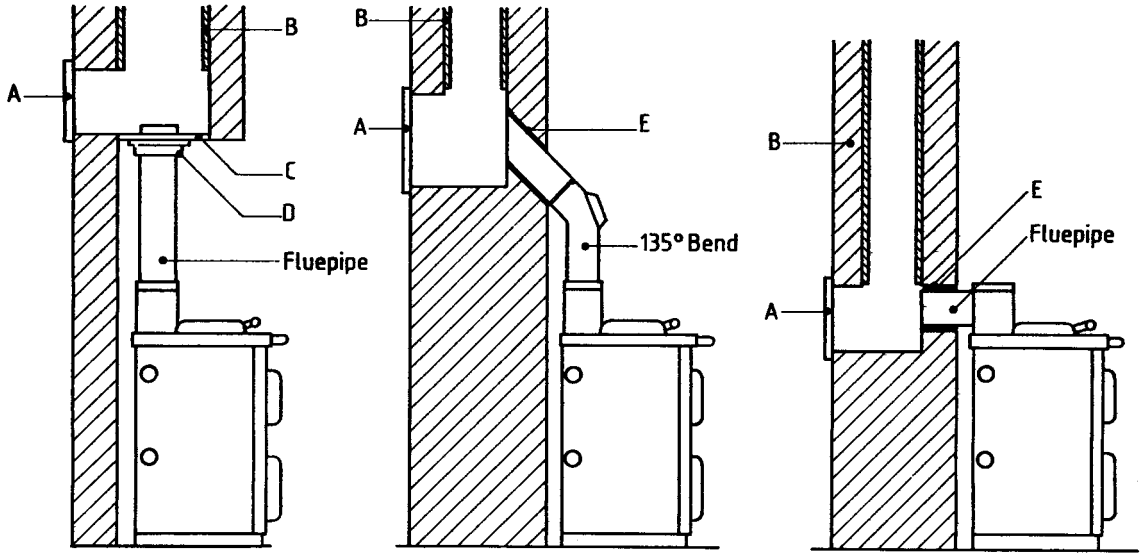
The manufacturer's recommendation for fixing should be followed. The most common method is to secure the base of the appliance to the hearth using rag bolts or screws into non-combustible plugs.

6 Air inlets

The combustion air inlet sizes specified in **5.3** of BS 8303-1 are the minimum that are required. Open fires require more air than closed appliances because of the additional air that enters the appliance above the firebed. The air is needed for secondary combustion and to prevent flue gas spillage from the fire. The throat created by the fireback and throat lintel are specially shaped to assist the flow into the flue.

The size of the combustion air inlets takes into account the fact that rooms are not usually airtight even when all doors and windows are closed. Consequently there is no requirement to have an air inlet for closed appliances with an output less than 5 kW, as enough adventitous air is usually available for satisfactory operation.

The ideal position for the air inlets is adjacent to the fireplace recess. Where it is not desirable to provide inlets from outside directly to this location so as to avoid cold draughts, a suitable place of entry is into an unoccupied area such as the hall. In this way there is an element of preheating of the air before it enters the living areas. Apertures of at least the size specified in **5.3** of BS 8303-1 should be provided in partitions between the air inlet and the appliance in order to allow an unrestricted route for the air to reach the appliance.



a) Recess with flue cavity

b) Plain wall using top outlet

c) Plain wall using rear outlet

A Flue cleaning door

B Flue liner

C Register plate sealed to brickwork

D Flue pipe collar with rope seal

E Rope seal

Figure 1 — Typical flue connection of a freestanding cooker or independent boiler

Some appliances are designed for use with underfloor air supplies ducted to the fire. The use of the underfloor system of ducting may also be suitable for other fires. Where ducting cannot readily be provided within or under a floor an alternative technique is to duct air from the roof space. Where this ducting passes through other parts of the house, it should be installed in a manner that provides a rated resistance to the spread of fire (see **5.2** of BS 8303-1) appropriate to the application; in single occupancy dwellings, materials having a 30 minute rating is usual, in dwelling containing flats (multiple occupancy) 90 minutes may be required.

Open fires tend to induce considerable air changes in the room and, to minimize this effect, it is recommended that provision be made for restricting the throat. This may be done with an insertable throat restrictor conforming to BS 3376:1991. Other forms of adjustable throat may be used provided that this allows for flue sweeping.

7 Sealing of joints

For a successful installation, joints should be sealed in order to prevent the ingress of unwanted air into the chimney and to reduce the risk of combustion products escaping into living areas, and, in the case of an open fire, to ensure that control of combustion is possible.

In most instances the seal can be made with the use of a soft, flexible non-combustible rope or tape of thicknes suitable for the size of gap which it needs to fill. The rope must be well tamped into the gap but be flexible enough to allow some movement of the joint due to expansion and contraction. The rope can be held in place with a covering of fire cement. This technique is especially recommended for jointing the flue pipe to the appliance, the raft lintel or register plate. In the latter cases the joint could benefit from the use of a clamping ring which squeezes the rope against the face. Some manufacturers supply a purpose-made flue pipe for this which has lugs with screws to apply the pressure on the clamping ring and hence the rope.

Special attention should be given to ensuring the presence of a flexible seal around the ashpit area of an open fire. This includes the base where the fire sits on the hearth as well as the side of the fire where it meets the fireplace surround.

Where a flue pipe enters a chimney through a hole in the chimney wall it is neccessary to sleeve the hole and seal the flue pipe into the sleeve. This may be achieved by cementing in a short length of metal pipe with an inside diameter at least 25 mm larger than the outside diameter of the flue pipe. Both ends of the sleeve should be cut to the angle formed with the chimney. The space between the flue pipe and the sleeve should be well caulked with several turns of soft non-combustible sealing rope or other suitable heat resisting material and well tamped in. It is important that the sleeve and the flue pipe do not project inside the chimney flue (see BS 8303-1:1994, Figure 8). This is to avoid the accumulation of fly ash.

8 Flue size

The flue sizes for the various categories of appliance are given in Table 1 of BS 8303-1; these are the minimum sizes that should be used on a universal basis for the successful operation of a solid fuel appliance.

In general the size of flue is chosen to ensure adequate evacuation of combustion products. The major operating force providing the flue draught to evacuate the products of combustion is the buoyancy of the flue gases which is mainly dependent upon the temperature of the flue gas itself but also upon the height of the chimney. An open fire generates a considerably larger volume of flue gas than a closed appliance and therefore needs a bigger capacity flue. In addition the flue gas temperature from an open fire is considerably less than a closed appliance and therefore the buoyancy (or flue draught) is also less.

Where a chimney is particularly tall, and to prevent excessive draught as may be the case in multi-storey houses, then it may be neccessary to fit a flue draught stabilizer. It is essential that this device is fitted in the same room or space as the appliance.

9 Separation from combustible material

9.1 Fireplace recess

Care should be taken to prevent combustible materials being damaged or ignited when they are subjected to heat from any of the causes described in **5.4** of BS 8303-1. In the case of a fireplace recess the walls should be of sufficient thickness to prevent the temperature of adjacent combustible material from reaching in excess of 100 °C. The thickness will depend on the insulating property of the material of construction. For traditional brick or concrete block construction the dimensions given in Figure 2 should be adopted.

9.2 Hearth

A hearth should be constructed from solid, non-combustible material at least 125 mm thick (this dimension may include the thickness of any solid, non-combustible floor under a hearth but excluding the thickness of any added decorative finish). Its dimensions should be at least those shown in Figure 3 a) for appliances installed into a fireplace recess, or at least those shown in Figure 3 b) for freestanding appliances. Combustible material should not be placed under a hearth unless:

a) it is to support the edges of the hearth; or

b) there is an air space of at least 50 mm between the material and the underside of the hearth, or there is a distance of at least 250 mm between the material and the top of the constructional hearth (see Figure 4).

When the surfaces of the appliance are such that any adjacent combustible materials will not exceed 100 °C e.g. where the appliance is surrounded by a boiler then the provisions of Figure 4 for a hearth are not required. However when a change of appliance occurs the suitability of the hearth should be confirmed.

A hearth is a neccessary part of the installation of an appliance not only for protection of combustibles from the heat transmitted directly from an appliance but also to prevent damage resulting from hot ash or embers falling from it. For this reason a hearth should extend beyond the extremities of the appliance and the dimensions given in Figure 5 should be followed. Some appliances may have a fold down tray attached that can act as the part of the hearth in front of it when de-ashing or refuelling. In these circumstances the manufacturer's recommendations should be followed regarding clearance around the appliance.

Where an appliance is situated adjacent to a wall containing combustible material e.g. a stud partition wall then the dimensions in Figure 6 should be adopted.

It may be possible to reduce the dimensions of separation from combustible materials depending on the insulating ability and nature of the protecting non-combustible material. Insulating material such as ceramic fibre with a high thermal resistance can be used where space is at a premium and where reduced dimensions may be desirable. This should only be considered where sufficient information or practical experience is available to ensure that damage or ignition of combustible material is prevented.

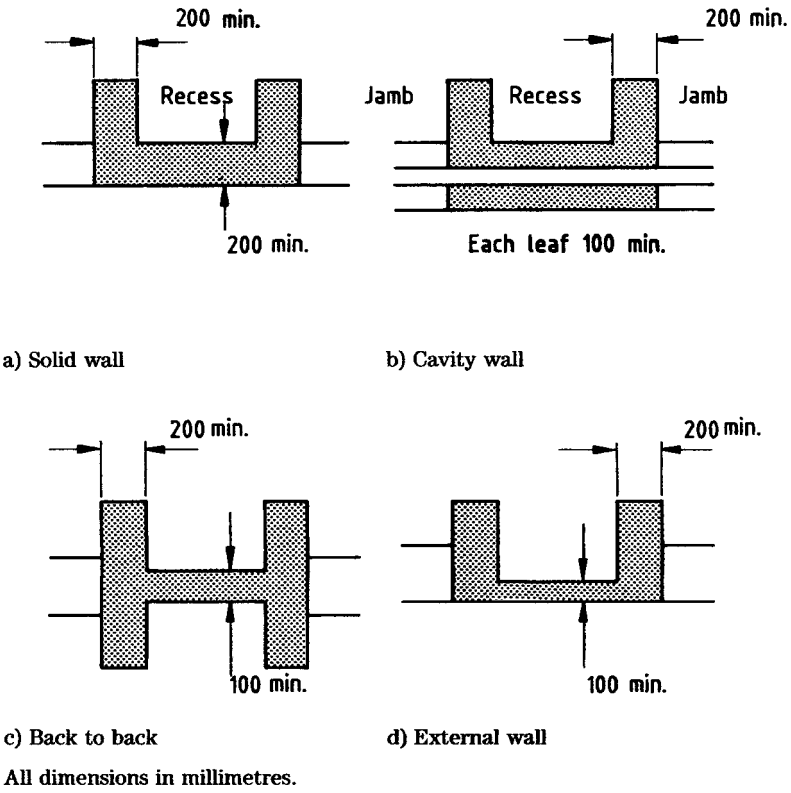
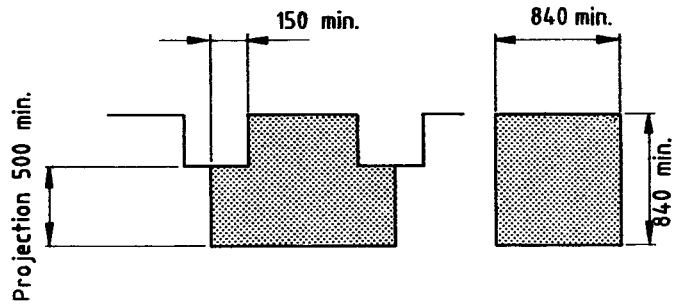


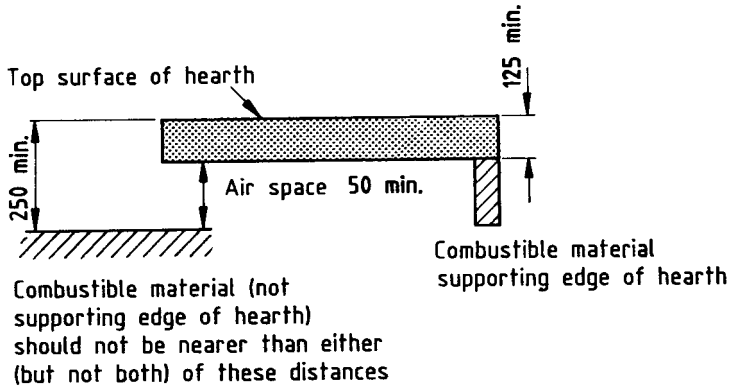
Figure 2 — Dimensions of a fireplace recess



a) Fireplace recess b) Freestanding

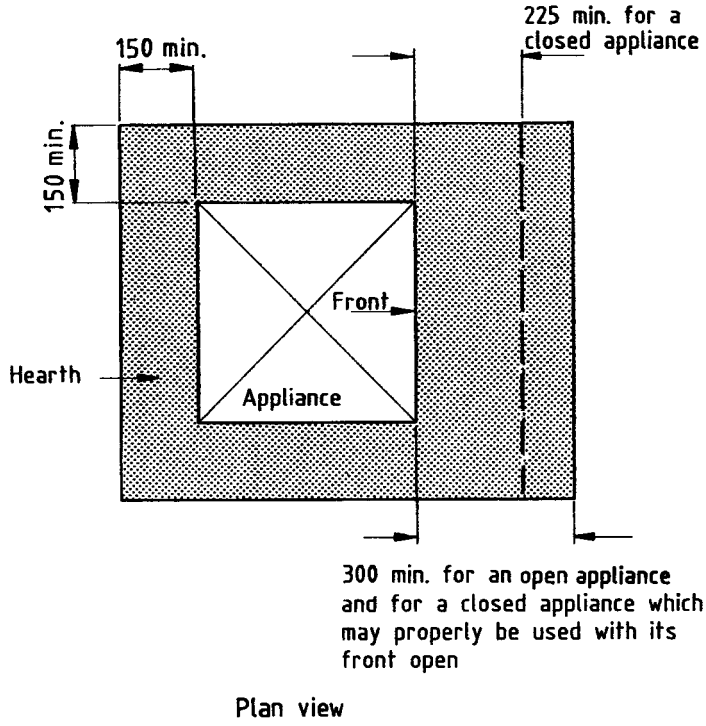
All dimensions in millimetres.

Figure 3 — Dimensions of a constructional hearth



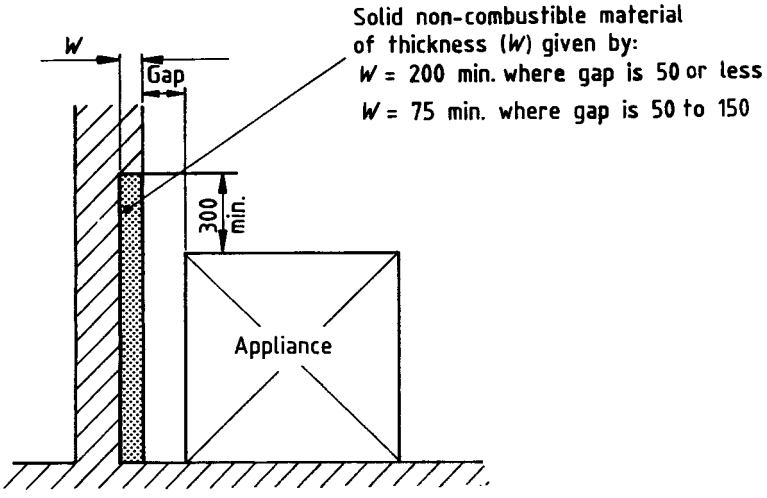
All dimensions in millimetres.

Figure 4 — Combustible material under hearth



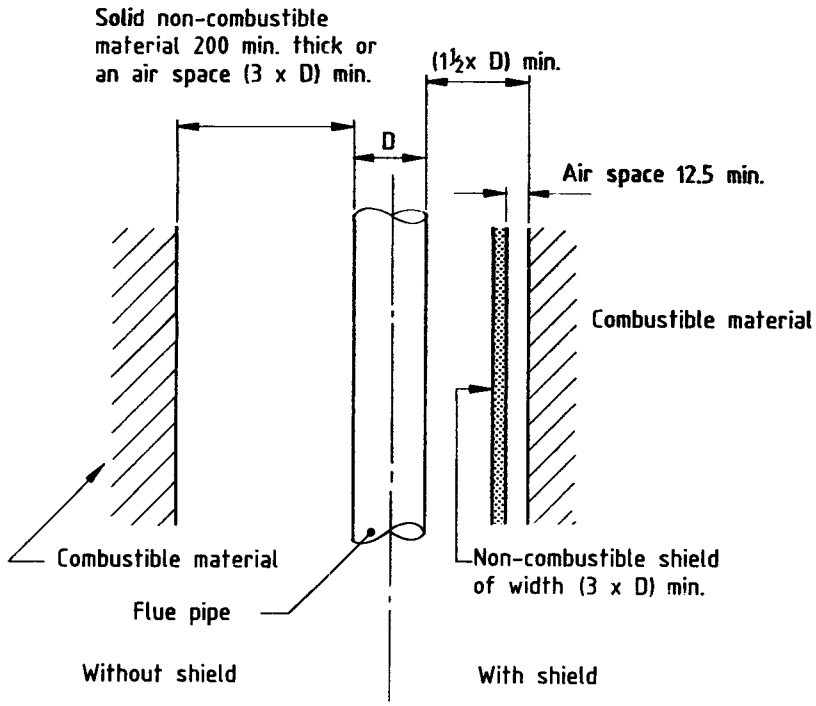
All dimensions in millimetres.

Figure 5 — Positioning of appliance on a hearth



All dimensions in millimetres.

Figure 6 — Distance of an appliance from combustible material



All dimensions in millimetres

Figure 7 — Separation of flue pipe from combustible material

9.3 Flue pipes

Uninsulated flue pipes should be separated from combustible material according to the dimension of Figure 7. However, as described above, it may be possible to reduce these dimensions if the flue pipe is insulated. In this case, it is essential that the insulating material is capable of withstanding the high temperature which can occur on the surface of the flue pipe. Fibrous mineral glass wool may not be suitable.

9.4 Soot doors

Where a soot door is located adjacent to combustible material it should be adequately insulated or separated from it enough to ensure that the temperature of the combustible material does not reach in excess of 100 °C during normal operation. Where an insulated soot door is provided in a factory-made chimney, the gap between the surface of the soot door and the combustible material is specified by the chimney manufacturer but is commonly 50 mm. Where an insulated door is used, for example through a stud position wall, there should be at least 150 mm separation from combustible material.

9.5 Register plates

A register plate should be secured to combustible material as heat from a flue pipe can be conducted through the register plate in spite of the presence of non-combustible sealing material applied to the joint.

A top register plate should be constructed of corrosion resistant metal plate not less than 1.5 mm thick, attached along its four edges to the fireplace recess by steel angle section. The joints between the steel angle, the recess and the top register plate should be sealed using fire cement or a similar non-combustible sealing material.

A back register plate should be constructed of corrosion resistant metal plate not less than 1 mm thick. It should be supported on a metal frame attached to the surround of the fireplace opening. Fire cement or other similar non-combustible sealing material shall be used to seal the metal frame to the surround and the plate to the frame.

10 Noise

Noise from the operation of an appliance, for example with mechanical de-ashing devices and from motors, is readily transmitted through solid material. For this reason an installation associated with a common or solid party wall can cause disturbance in adjacent occupied areas. The choice for the location of the appliance should therefore take account of the likelihood of noise being a sufficient nuisance as to prevent sleep or rest by occupants.

11 Energy economy and heat retention

The purpose of an installed appliance should be to provide as much heat as possible towards satisfying the heat requirements of the dwelling and its occupants.

The most energy effective installation is one situated in the centre of the dwelling where much of the residual heat in the building structure e.g. fireplace and chimney is not lost during operation. As appliance efficiencies improve so less heat is given up to the structure and more is available directly from the appliance. This is beneficial in circumstances where the structure does not contribute effectively to heating the dwelling.

In assessing the type of installation best suited to particular needs, the designer in consultation with the purchaser, should bear in mind that masonry structures tend to have a large thermal capacity for storing energy. They take longer to heat up than a factory made structure but also give up the stored energy over a relatively longer period. This may be an advantage for intermittent occupancy situations where some heat is available even when the appliance is not in use for a short time.

12 Alternative flue pipe construction

Some appliance manufacturers provide a length of pipe manufactured from material other than that specified in **9.3** of BS 8303-1. The use of these pipes is acceptable only on the understanding that they are used as a former for the infill material which then acts in combination as a successful flue pipe.

The use of cement based flue pipes have generally fallen out of favour. This is because it is essential for the material to withstand high flue gas temperatures. Whilst some materials are suitable the manufacturer's instructions should be followed, especially in relation to drying out. As some appliances are not fired for some while after installation e.g. while waiting for occupancy, care should be taken that they have not become wet.

13 Gas ignition

Some open fires have provision for ignition by an integral gas burner. If this is to be used then a gas point should be provided.

NOTE Attention is drawn to the Gas Safety (Installation and Use) Regulations [3].

14 Firebacks and infill

A fireback is manufactured from high temperature refractory material, which may be subjected to temperatures in excess of 1 000 °C during appliance operation. Consequently it should be installed in a manner that allows for expansion and contraction. Figure 1 of BS 8303-1 provides general guidance for the installation of a complete fireback and Figure 2 of BS 8303-1 gives an example where part of the fireback is a boiler. In this case the sides of the fireback should be shaped to conform to the required dimensions.

The space behind the fireback should be filled and flaunched to ensure a smooth passage for combustion products into the flue. Suitable alternative infill compositions using exfoliated vermiculite or expanded perlite bonded with lime or cement are given in Table 1. During filling, these compositions are wetted with just sufficient water to enable the mixture to bind together when lightly compressed.

NOTE Suitable types of vermiculite and perlite are proprietary grades normally supplied for the purpose of loose fill loft insulation in domestic dwellings. The perlite should be of a grade pretreated to supress dust.

Table 1 — Composition proportion for in-fill

Material	Proportions by volume		
	a	*b*	*c*
Exfoliated vermiculite	4	6	—
Expanded perlite	—	—	8
Hydrated lime	1	—	—
Portland cement	—	1	1

15 Testing an installation

An installation should be tested before final handover to ensure that it is able to give the expected service.

For appliances without a boiler it is usually sufficient to check that it responds to its controls. A check to see that all joints have been properly made and have remained intact after only a limited firing can be undertaken with a lighted taper or smoke source.

For appliances with a boiler the performance may be verified within 3 h to 4 h from lighting the fire, starting with cold water and obtaining a gradual increase in temperature of the water drawn from the draw-off points from time to time and/or of the heat emitters and circulation pipework. The rate of heating-up will depend upon the output of the boiler and the capacity of the storage vessel.

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List of references (see clause 2)

Normative references

BSI publications

BRITISH STANDARDS INSTITUTION, London

BS 1846, *Glossary of terms relating to solid fuel burning equipment.*
BS 1846-1:1994, *Domestic appliances.*
BS 8303, *Installation of domestic heating and cooking appliances burning solid mineral fuels.*
BS 8303-1:1994, *Specification for the design of installations.*
BS 8303-2:1994, *Specification for installing and commissioning on site.*

Informative references

BSI publications

BRITISH STANDARDS INSTITUTION, London

BS 5449:1990, *Specification for forced circulation hot water central heating systems for domestic premises* [1)].

Other references

[1] GREAT BRITAIN. *Building Regulations.* London: HMSO [1)].
[2] GREAT BRITAIN. *Clean Air Act.* London: HMSO[1)].
[3] GREAT BRITAIN. *Gas Safety (Installation and Use) Regulations.* London: HMSO.

[1)] Referred to in foreword only.

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