

Chapter 6.8



Fireplaces, chimneys and flues

This chapter gives guidance on meeting the Technical Requirements for fireplaces, chimneys and flues.

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Definitions for this chapter

For the purposes of this chapter, the following definitions apply:

Balanced-flue chimney	Chimney comprising separate ducts for air supply and flue gas in concentric or parallel arrangement where the inlet of the air supply duct is adjacent to the outlet of the flue and the inlet and outlet being so positioned that wind effects are substantially balanced.
Builders opening	Enclosure constructed by builders to accommodate fireplace components.
Chimney	Structure consisting of a wall or walls enclosing a flue or flues conveying the products of combustion into the outside atmosphere.
Connecting flue pipe	Component or components connecting the combustion appliance outlet and the chimney.
Draught control	Device with a flap in a flue opening to allow entry of secondary air into the flue to regulate the draught.
Fireplace surround	Purpose-designed setting for a fire, fitted against a wall and usually incorporating a hearth.
Fireplace recess	Recess formed by the inclusion of fireplace components in the builders opening.
Flashings	Prefabricated components or site fabricated materials used for weatherproofing the penetration of the roof by the chimney.
Flue	Passage for conveying the products of combustion to the outside atmosphere.
Flue block	Factory-made single or multi-wall chimney component with one or more flues.
Flue liner	Rigid or flexible inner wall of a chimney consisting of components the inner surface of which is in contact with products of combustion.
Hearth	Slab of fire-resisting material to prevent overheating of the surface beneath the appliance.
Liquid fuel	Mineral, vegetable or synthetic liquid or blends thereof, intended for combustion in boilers or cookers.
Multi-wall chimney	Chimney consisting of a flue liner and at least one additional wall.
Open-flued 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.
Preformed chimneys	Chimneys manufactured offsite, situated above the roofline, forming part of the building envelope and exposed to the external environment. They may be designed to replicate the aesthetics of a traditionally-constructed chimney (eg masonry). Chimneys of this type may or may not contain working flues.
Products of combustion	Products resulting from the combustion of fuel.
Single wall chimney	Chimney with only one wall.
Terminal	Component installed at the outlet of a chimney or a flue liner.
Terminal guard	Device fitted over a terminal and/or air inlet in order to protect persons from contact with, prevent interference with, and prevent damage to the terminal, and also to prevent flue blockage.

6.8.1 Compliance*Also see: Chapter 2.1*

Fireplaces, chimneys and flues shall comply with the Technical Requirements, working fireplaces shall be designed to ensure efficient operation of the appliance, an adequate supply of combustion air and protection for the building fabric. Preformed chimneys shall comply with R3 and hold a satisfactory assessment by an appropriate independent technical approvals authority acceptable to NHBC.

Fireplaces, chimneys and flues which comply with the guidance in this chapter will generally be acceptable.

Installations should be provided with an adequate supply of combustion air:

- as stipulated by statutory requirements and relevant Building Regulations
- to ensure satisfactory combustion of fuel and the efficient working of flues and chimneys.

Where a chimney or flue is provided it should be continuous from the hearth or appliance to the outside air. The design of homes which incorporate chimneys and flues should ensure that all details of the associated elements are considered and appropriate provisions made. This should include the following:

- fire risk and separation
- hearths and the constructions adjacent to hearths and flues
- chimneys and flues, including projections through the building
- terminals and outlets
- limitations on the appliance or open fire which can be installed, and fuel which can be used.

Good workmanship and effective supervision during construction are essential to ensure that fireplaces, chimneys and flues function correctly in use.

Fireplaces, chimneys and flues should be designed and installed to minimise the risk of the building catching fire. The design of timber frame construction should ensure that combustible material is:

- suitably separated from heat sources, or
- shielded, where permitted.

6.8.2 Provision of information

Designs and specifications shall be produced in a clearly understandable format, include all relevant information and be distributed to the appropriate personnel.

Clear and fully detailed drawings should be available on site to enable work to be carried out in accordance with the design. Design and specification information should be issued to site supervisors, relevant specialist subcontractors and suppliers, and include the following information:

- position and size of hearths, fireplaces, chimneys and flues
- position and proximity of combustible materials
- position and details of flue terminals or outlets
- position of DPCs and flashings
- construction details of fireplace openings and chimney connections
- details of materials to be used
- limitations of the type of appliance or open fire that can be installed and fuel that can be used
- details of the tests required on chimneys and flues, including who is responsible for carrying them out.

6.8.6.1 Separation from adjacent spaces and materials

Combustible materials close to any brickwork or blockwork chimney (not applicable to floorboards, skirting, dado or picture rails, mantelshelves or architraves) should be adequately separated.

Where the home is of timber frame construction, full details of the separation proposal should be included in the design.

Materials used for chimneys should be capable of resisting fluctuating temperatures up to 1,100°C.

6.8.6.2 Flue liners

Flue liners should:

- have rebated or socketed joints installed with the socket or internal rebate facing uppermost
- be installed in accordance with the manufacturer's recommendations
- be non-combustible
- be properly jointed at their junctions with the starter block, or lintel, and the outlet terminal
- be reasonably smooth on the inside
- be correctly jointed with mortar (the space between the liners and the brickwork should be filled with weak insulating concrete unless the manufacturer recommends an alternative)
- have any changes in direction formed using purpose-made bends (cut pipes are not acceptable).

6.8.6.3 Resistance to frost attack

Where clay brick chimneys are above roof level and are not protected by a capping with an adequate overhang and drip (see Clause 6.8.7.3), the chimney should be constructed using F2,S1 or F2,S2 bricks to BS EN 771. They should be bedded in mortar, either:

- 1½:4 to 4½, cement:lime:sand, or
- 1:3 or 4, cement:sand with plasticiser.

Where external chimneys built with clay bricks of F2,S1 designation are rendered, sulfate-resistant cement should be used.

In Scotland, external facing brickwork should be constructed using frost-resistant bricks.

6.8.6.4 Resistance to weather

In areas of severe or very severe exposure, cavities should be continuous up to roof level. This applies to:

- cavities below roof level where the stack forms part of an external cavity wall
- the complete chimney structure, including the fireplace recess.

In areas of severe or very severe exposure, and where the chimney breast is gathered in, the lower projecting masonry should be protected against damp penetration with a suitable capping and cavity trays (see Clause 6.8.28.2).

Above the roof:

- chimney DPCs should link with flashings; where the roof is steeply pitched (where the difference in level between the lower and higher intersection of the chimney with the roof will be more than 450mm), two Damp Proof Course (DPC) should be used at suitable levels
- plastic DPCs are not suitable
- face brickwork should not have recessed joints
- where lead trays are in contact with mortar, they should be protected with a thick coat of bitumen or bitumen paint
- where chimneys are to be rendered, render should be in accordance with Chapter 6.11 Render.

6.8.7 Solid fuel – outlets and terminals

Outlets and terminals shall be adequately separated from combustible material and other parts of the home, enable the satisfactory discharge of flue gases and prevent the ingress of damp. Issues to be taken into account include:

- 1) outlet position
- 2) terminals
- 3) chimney cappings.

Outlets and terminals for solid fuel use should be in accordance with relevant Building Regulations

6.8.7.1 Outlet position

The flue will generally function more effectively where the outlet is in a low pressure zone, taking account of prevailing winds.

A low pressure zone generally occurs:

- on the sheltered side and at the ridge of a pitched roof
- close to the windward side of a flat roof.

Where the efficiency of the flue may be affected by adjacent trees or buildings in the low pressure zone, the design should account for their effects.

Where down draughts occur, eg on hillsides or near tall trees and buildings, the height of the flue outlet may have to be increased or a fan-assisted flue installed.

6.8.7.2 Terminals

Terminals should be:

- purpose-made components
- built into the top of the masonry to a minimum of 125mm or $0.25 \times$ the length of the terminal, whichever is the greater
- sealed to the flue liner.

An acceptable terminal can be achieved where the top flue liner projects a minimum of 20mm above the chimney capping.

6.8.7.3 Chimney cappings

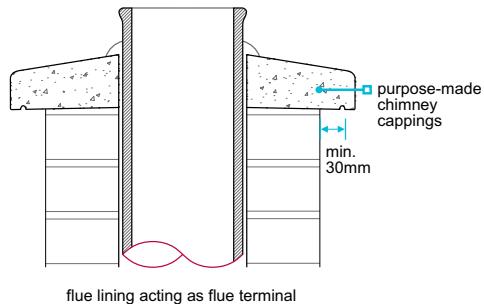
Chimney cappings should:

- be weathered, monolithic slabs
- be designed to protect the masonry below
- have a drip at least 30mm from the chimney face to shed water clear of the masonry.

Cappings may be designed as a cover slab supported on piers (to reduce rain penetration into the top of the flue). The height of the supporting piers should be sufficient to allow a free opening equivalent to a minimum of $2 \times$ the area of the flue outlet.

Brick chimneys which do not have this type of capping should be constructed using frost-resistant masonry.

Figure 1: Chimney capping



6.8.8 Gas – fireplaces and hearths

Fireplaces and hearths shall safely accommodate the fire or appliance for which they are designed. Issues to be taken into account include:

1) separation from combustible materials

2) provision of hearths and recesses.

Gas appliances should:

- be fitted by a Gas Safe Registered (GSR) installer holding the relevant competencies for the work in hand, and
- comply with the Gas Safety (Installation and Use) Regulations 1998.

6.8.8.1 Separation from combustible materials

Combustible materials close to any chimney/flue should be adequately separated in accordance with relevant Building Regulations and manufacturers' instructions.

6.8.8.2 Provision of hearths and recesses

The provision of hearths and recesses for gas fireplaces should be in accordance with relevant Building Regulations.

Solid fuel effect appliances

Hearths and recesses for solid fuel effect appliances should be:

- in accordance with BS 5871
- in accordance with the requirements for solid fuel appliances (see Clause 6.8.3).

Where the appliance has been tested by an approved authority, in accordance with the manufacturer's instructions.

For all forms of gas appliances, the hearths should be marked at the edges to:

- provide a warning to the homeowner
- discourage combustible floor finishes, such as carpet, from being laid too close to the appliance (this can be achieved by introducing a change in level).

6.8.9 Gas – combustion air**Installations shall be provided with an adequate supply of combustion air.**

Gas appliances should have an air supply from external air, either directly or indirectly, to comply with statutory requirements and the manufacturer's recommendations. Full details of ventilation requirements for all types of gas appliances are contained in relevant Building Regulations and BS 5440-2.

6.8.10 Gas – flue pipes

Flue pipes shall safely connect an appliance to a chimney, or a flue to a terminal. Issues to be taken into account include:

- 1) size, direction and jointing
- 2) separation from combustible materials.

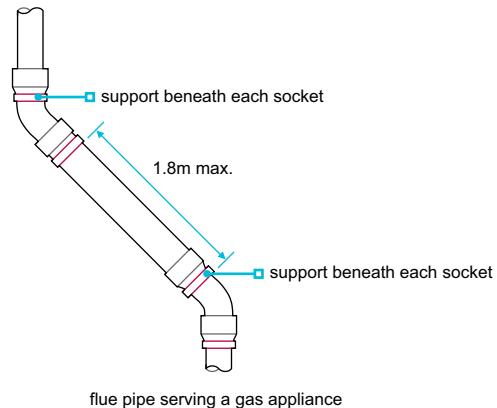
6.8.10.1 Size, direction and jointing

Gas flue pipes should:

- not have adjustable draught control
- have a free area which is at least the same size as the outlet of the appliance
- not be horizontal (does not apply to balanced flues)
- be fixed in accordance with the manufacturer's recommendations
- be fixed socket up (as appropriate) and be correctly aligned
- where they are long, have support directly below each socket, with a maximum spacing of 1.8m
- have appropriate access for inspection and be in accordance with relevant Building Regulations.

When connecting flue pipes to flue blocks and ridge terminals, proprietary connectors should be used.

Figure 2: Gas flue pipe support distances

**6.8.10.2 Separation from combustible materials**

Combustible materials close to any chimney/flue should be adequately separated in accordance with relevant Building Regulations and manufacturers' instructions.

6.8.11 Gas – chimneys

Chimneys shall incorporate flues capable of safely conducting products of combustion from an appliance to the external air. The structure shall be capable of supporting the flue and providing adequate protection to adjacent materials. Issues to be taken into account include:

- 1) flues and flue liners
- 2) chimneys.

6.8.11.1 Flues and flue liners

Flue blocks for use with gas appliances should comply with BS EN 1858 (concrete) or BS EN 1806 (clay).

Rigid metal flue liners and chimneys should comply with BS EN 1856 or be as described in Clause 6.8.6.2 (as appropriate). Flexible flue liners are not acceptable in a new build.

6.8.11.2 Chimneys

Chimneys for gas appliances must not incorporate an adjustable draught control.

Masonry chimneys

Flues within masonry chimneys should be in accordance with the requirements relevant to flues for solid fuel appliances (see Clause 6.8.6.2).

Brickwork or blockwork chimneys for gas appliances should, at minimum, have the same level of fire resistance as each compartment wall or floor which it forms part of, or passes through. The compartment wall may form the chimney wall where it is a masonry material of suitable thickness.

Terminals to masonry chimneys where proprietary should comply with BS EN 1856, BS EN 1858 and the appliance manufacturer's recommendations.

Where proprietary products are not used, have a free opening area a minimum of 2x the area of the flue; there should be openings (6-25mm in diameter) distributed uniformly around the terminal or on two opposite faces.

Flue block chimneys

Flue block chimneys can only be used for certain types of gas appliances and should be:

- compliant with BS EN 1858 (if concrete) or BS EN 1806 (if clay/ceramic), with a minimum performance class of FB4 N2
- constructed using units suitable for the appliance
- constructed, jointed and weatherproofed in accordance with the design and the manufacturer's instructions
- correctly bonded to the flanking masonry
- clean and sealed
- checked for suitability, before connecting any appliance.

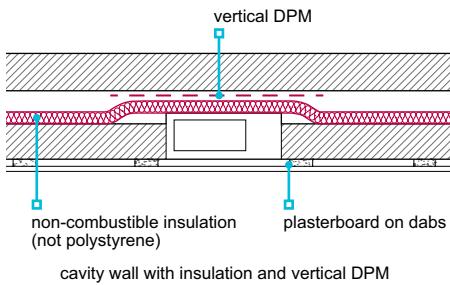
Connections between flue blocks and ridge terminals should be made:

- in accordance with the design
- using the correct fittings and supports as specified by the manufacturers of the flue blocks, flue pipe and ridge terminal.

Gas flue blocks are at least 140mm wide. Where this is wider than the wall leaf:

- the extra thickness should be incorporated by increasing the overall width of the cavity
- the flue block should be installed flush with the inside of the cavity and project into the room as a false chimney breast, or
- where the cavity is reduced, the flue block should be protected by a vertical DPM supported by a layer of non-combustible insulation, in accordance with the manufacturer's instructions.

Figure 4: Precast flue block cavity wall insulation and vertical DPM



Flue blocks should not be:

- built into separating walls unless it can be shown that the wall has adequate sound resistance
- plastered; a plasterboard lining with an air space or non-combustible insulation behind it should be provided (insulated dry lining may be unsuitable in this situation unless separated from the flue block).

Figure 3: Gas precast flue blocks to ridge terminal transition

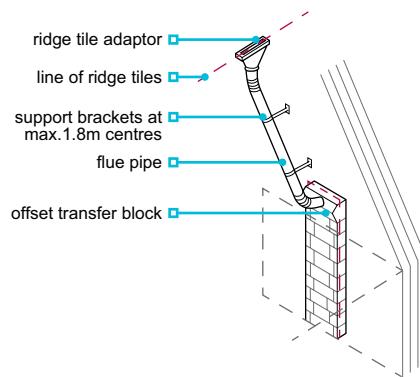
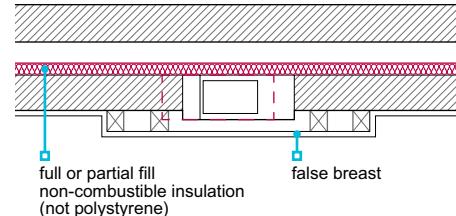


Figure 5: Precast flue blocks — false chimney breast arrangement with insulated cavity wall



Factory-made insulated chimneys

Factory-made insulated chimneys should:

- be assembled, erected, anchored and protected in accordance with the manufacturer's instructions
- comply with BS EN 1856 and be installed in accordance with BS 6461, BS EN 15287-1 or BS 5440-1, as appropriate.

6.8.12 Gas – outlets and terminals

Outlets and terminals shall be adequately separated from combustible material and other parts of the home, and prevent the ingress of damp.

Relevant standards and guidance for gas appliances, chimneys and flue terminals:

BS 5440-1	Flues
IGE/UP/7	Gas installation in timber framed and light steel framed buildings

Terminal guards should be fitted over all gas flue terminals where persons could come into contact with the terminal, or it could be damaged.

BS 5440-1 advises that, in the absence of any specific guidance from the appliance manufacturer, terminals less than 2m above ground, above a balcony, or above a flat roof which people have access to, should be guarded.

The appliance manufacturer may specify a suitable terminal guard.

Precautions should be taken, where appropriate, to prevent damp penetration in accordance with the requirements for resistance to frost attack and weathering for solid fuel appliances (see Clauses 6.8.6.3 and 6.8.6.4).

All flues which bridge the cavity of an external wall should have a means of preventing moisture crossing the cavity, eg a moisture drip collar set in the centre of the cavity. For timber frame construction, the guidance in IGE/UP/7 should be adopted in relation to non-combustible sleeving and to maintain the integrity of the vapour control layer (VCL).

Where cavity trays and weepholes are used, they should be in line with Chapter 6.1 External masonry walls.

Figure 6: Drip collar for circular flues — cross-section

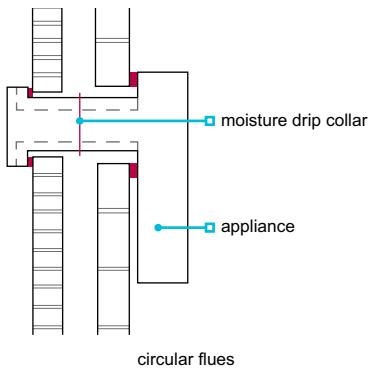
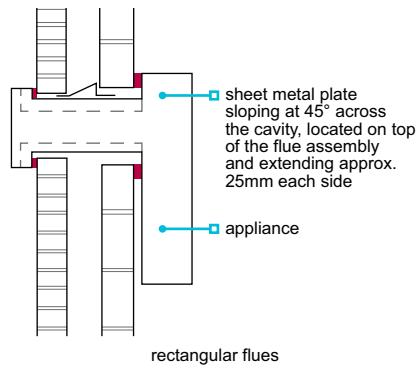


Figure 7: Drip collar plate detail for rectangular flues — cross-section

**6.8.13 Liquid fuel – fireplaces and hearths**

Fireplaces and hearths shall safely accommodate the fire or appliance and be suitably separated from combustible materials.

Where the temperature of the hearth below the appliance is:

- likely to exceed 100°C, or the temperature is not known, precautions should be in accordance with the requirements for hearths for solid fuel appliances (see Clause 6.8.3).
- unlikely to exceed 100°C, the appliance may stand on a rigid, non-combustible imperforate sheet of material without a constructional hearth.

Where appliances are likely to have back or side temperatures exceeding 100°C, hearths and shielding should be in accordance with the requirements for gas appliances (see Clause 6.8.8).

6.8.14 Liquid fuel – combustion air

Installations shall be provided with an adequate supply of combustion air.

Liquid fuel appliances should have an air supply from external air, either directly or indirectly, to comply with statutory requirements and the manufacturer's recommendations. Full details of ventilation requirements for all types of appliances are contained in relevant Building Regulations.

6.8.15 Liquid fuel – flue pipes

Flue pipes shall safely connect an appliance to a chimney.

Flue pipes should have a free area which is at least the same size as the outlet of the appliance and be installed in accordance with relevant Building Regulations and manufacturers' instructions.

6.8.16 Liquid fuel – chimneys

Chimneys shall incorporate flues capable of safely conducting products of combustion to the external air. The structure shall be capable of supporting the flue lining and shall provide adequate protection to adjacent materials. Issues to be taken into account include:

1) stability, size and direction	3) flue liners
2) separation from adjacent spaces, materials and combustible materials	4) resistance to frost/chemical attack
	5) resistance to weather.

6.8.16.1 Stability, size and direction

Flue pipes should:

- have a free area which is at least the same size as the outlet of the appliance
- if serving open-flued appliances, be vertical where possible. Where this is not possible, pipes should not be more than 45° from the vertical.

Factory-made, metal insulated chimneys should:

- be designed in accordance with BS EN 1856 and BS EN 1859 and installed in accordance with BS EN 15287, or be assessed in accordance with Technical Requirement R3
- have a minimum operating life of 30 years
- where they are part of a component system, comply with BS EN 1856 and be installed in accordance with the manufacturer's instructions.

6.8.16.2 Separation from adjacent spaces, materials and combustible materials

Flue pipes for liquid fuels should be separated from combustible materials in accordance with relevant Building Regulations and manufacturer's instructions.

6.8.16.3 Flue liners

As for gas flue pipes where the flue gases are unlikely to exceed a temperature of 250°C (see Clause 6.8.10). As for solid fuel flue pipes where the flue gases are likely to exceed a temperature of 250°C or the temperature is not known (see Clause 6.8.5).

Flexible flue liners are not acceptable for new build.

6.8.16.4 Resistance to frost/chemical attack

Resistance to frost attack as for solid fuel (see Clause 6.8.6.3).

6.8.16.5 Resistance to weather

Resistance to weather as for solid fuel (see Clause 6.8.6.4).

6.8.17 Liquid fuel – outlets and terminals

Outlets and terminals shall be adequately separated from combustible material and other parts of the home.

Balanced flue terminals should be positioned to allow free intake of air to the appliance.

Where terminals are of masonry construction, they should be in accordance with the requirements for solid fuel appliances (see Clause 6.8.7.2); otherwise, they should be in accordance with the manufacturer's recommendations.

6.8.18 All – fireplaces and hearths

Fireplaces and hearths shall safely accommodate the appliances for which they are designed.

Combustible material should not be placed under a constructional hearth unless it is:

- to support the edges of the hearth
- at least 250mm from the material to the top of the hearth, or
- separated from the underside of the hearth by an air space of at least 50mm.

Fireplace recesses should be constructed of solid non-combustible material as shown in the figures (dimensions are based on a 125mm concrete hearth below an open fire). The space between a fire back and masonry forming the recess should be filled with vermiculite concrete (1:4, lime:vermiculite with water).

6.8.19 All – fireplace surrounds

Fireplace surrounds and their fixings shall be designed, specified and installed to ensure adequate in-service performance and durability.

The fixing and support should safely accommodate the proposed type of fireplace surround (which could be manufactured in one or a number of pieces), taking into account its size and weight. The walls and floors of the building should safely accommodate the additional load of the proposed fireplace surround.

Fireplace surrounds should be installed by competent operatives, strictly in accordance with the manufacturer's recommendations and fixing specification, and fixed to the structure using mechanical fixings, giving full consideration to:

- the type of material used to manufacture the surround
- the configuration of the surround
- the size and weight of the surround
- the potential for overturning of the surround or parts thereof
- the type of supporting walls and floors, including the structure (eg framed or solid structure) and its finish (eg wallboard or wet finish)
- the type, material, number and location of fixings.

Fixings should be of durable material and be appropriate for the type of surround and the supporting wall or floor to which the surround is to be fixed. Fixings should generally be of stainless steel to BS EN ISO 3506-1 Mechanical properties of corrosion-resistant stainless steel fasteners and be specified to provide suitable strength and durability. Materials that comply with recognised standards which provide equal or better performance are also acceptable.

Methods that rely solely on adhesive for fixing fireplace surrounds to the structure are not acceptable.

More information on the installation of all types of natural and artificial stone fireplace surrounds can be found in the Stone Federation Great Britain Fireplace Surrounds Data sheet.

6.8.20 All – flue pipes

Flue pipes and terminals shall be suitable for their purpose and provide unrestricted passage for combustion gases between the fireplace, or appliance, and the outlet.

The connection between a fireplace, or appliance, and the flue should be correctly constructed.

Figure 8: Throat unit connection to lintel

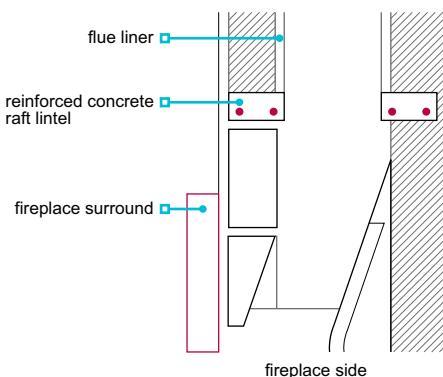


Figure 9: Chimney joint to connecting flue pipe

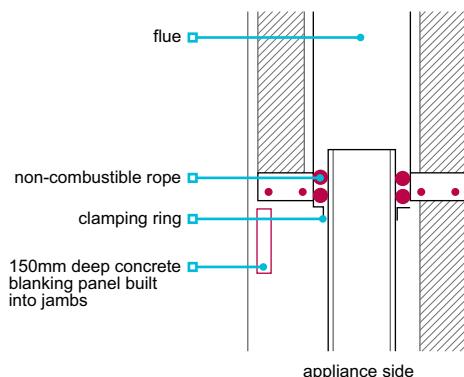
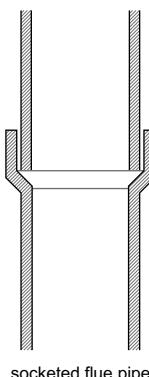


Figure 10: Socketed flue pipe (socket up)



Where the bottom of the flue is not directly over an appliance, it should be provided with a means of access for cleaning and inspection.

Adjustable flue draught control units are not permitted where gas burning appliances are installed. Where adjustable throat units are specified, they should be fitted in accordance with the manufacturer's instructions.

Flue pipes should be jointed in accordance with the manufacturer's instructions, fixed socket up, correctly aligned and jointed.

Table 2: Acceptable standards for flue pipes

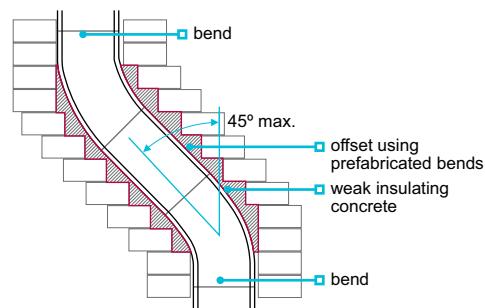
Flue material	Guidance
Metal flue pipes for gas appliances	BS EN 1856
Cast iron flue pipes	BS EN 1856
Mild steel flue pipes	BS 1449 (minimum 3mm wall thickness)
Stainless steel flue pipes	BS EN 10088 (minimum 1mm thick) and one of the following grades: 1.4401, 1.4404, 1.4432 or 1.4436
Vitreous enamelled flue pipes	BS EN 1856, low carbon steel coated internally and externally with acid-resisting enamel

6.8.21 All – flue liners

Flue liners shall be unaffected by flue gases and suitable for their purpose.

To produce a suitable flue path, appropriate components should be selected to keep cutting and joints to a minimum. At changes in direction, including bends, offsets and tees, purpose-made components should be used.

Figure 11: Offset chimney with flue liner suitable for solid fuel



chimney with flue liner suitable for solid fuel

Flue liners should be:

- clay or purpose-made concrete, as specified in the design
- handled carefully to prevent chipping or cracking
- installed in accordance with the manufacturer's instructions and the design
- sealed at their joint with the starter block or throat unit (no cavity should be formed between the linings and the starter elements)
- placed with the sockets or rebate ends facing up.

Liners suitable for solid fuel appliances, and generally suitable for other fuels, include liners whose performance is at least equal to the designation T450 N2 D 3, as described in BS EN 1443, such as:

- clay flue liners with rebates or sockets for jointing meeting the requirements for class A1 N2 or class A1 N1 as described in BS EN 1457
- concrete flue liners meeting the requirements for the classification type A1, type A2, type B1 or type B2 as described in prEN 1857(e18) January 2001, or
- other products that are independently assessed in accordance with Technical Requirement R3.

Alternatively, imperforate clay pipes with sockets for jointing as described in BS 65:1991 are acceptable.

Joints should be made in accordance with the manufacturer's recommendations, generally using:

- fire cement, or
- refractory mortar.

Joints should be fully filled, and surplus material cleared from the inside of each joint as the flue is built.

Spaces between the lining and the surrounding masonry should be:

- filled with weak insulating concrete, or
- in accordance with the manufacturer's recommendations, with the specified material providing adequate protection.

Ordinary concrete should not be used to fill the space between the lining and the surrounding masonry.

Check manufacturer's instructions for back fill requirements and relevant Building Regulations.

6.8.22 All – flues

Flue pipes should be separated from combustible materials in accordance with relevant Building Regulations and manufacturers' instructions.

Metal fixings in contact with combustible materials should be a minimum of 50mm from the flue.

This does not apply to a floorboard, skirting, dado or picture rail, mantel shelf or architrave.

Twin wall flue systems should comply with:

- BS EN 1856, or
- be assessed in accordance with Technical Requirement R3.

6.8.23 All – chimneys

Chimneys shall provide fire protective casing for flues, and shall be capable of adequately supporting the flue liner, while resisting damp penetration and the products of combustion. Issues to be taken into account include:

1) construction of chimneys	3) damp penetration and weatherproofing
2) typical construction details	4) coring and drying.

6.8.23.1 Construction of chimneys

Masonry chimneys should be properly bonded to, or supported by, the adjoining walls of the building.

Foundations to a chimney should:

- be the same depth as adjacent wall foundations
- be designed to avoid uneven settlement
- where the chimney forms part of the wall, be a minimum of 100mm wider than the chimney base.

The height (H) of an unrestrained chimney should:

- not exceed 4.5x the smallest dimension on plan of the chimney (W) (where the density of the masonry is a minimum of 1500kg/m³), or
- be designed by an engineer in accordance with Technical Requirement R5.

Chimneys which:

- are of block, brick or stone should have a minimum wall thickness of 100mm, excluding the lining thickness
- are built in a cavity separating wall should form two leaves, each a minimum of 100mm, between the flue and adjoining building

Factory-made insulated chimneys should be assembled, erected, anchored and protected in accordance with the manufacturer's instructions.

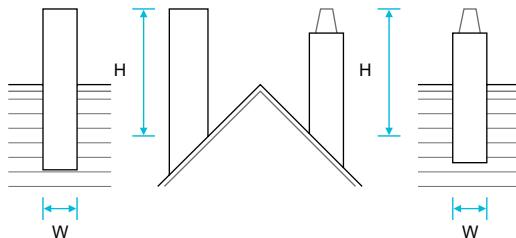
Masonry for chimneys:

- below roof level may be constructed using the same bricks and mortar as used for the general brickwork
- constructed with hollow or cellular blocks should be suitable for the construction of chimneys and filled with concrete as the work proceeds
- should be frost resistant above the roof unless protected by a capping projecting by a minimum of 50mm (in Scotland, frost-resistant bricks should be used for all facing brickwork).

Connections between flue blocks and ridge terminals should be made:

- as detailed in the design
- using the correct fittings and supports as specified by the manufacturers of the flue blocks, flue pipe and ridge terminal.

Figure 12: Calculating maximum chimney height to width



6.8.23.2 Typical construction details

Figure 13: Plan view of fireplace recess with frame

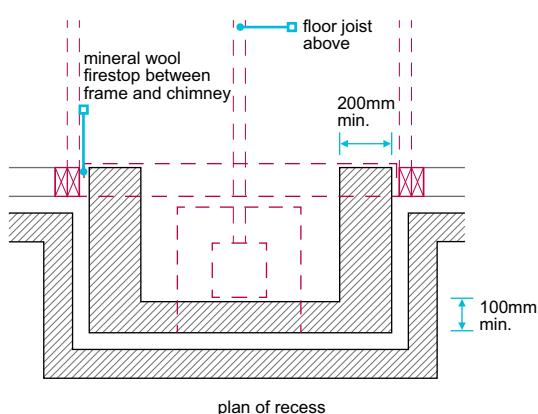


Figure 15: Timber chimney frame construction

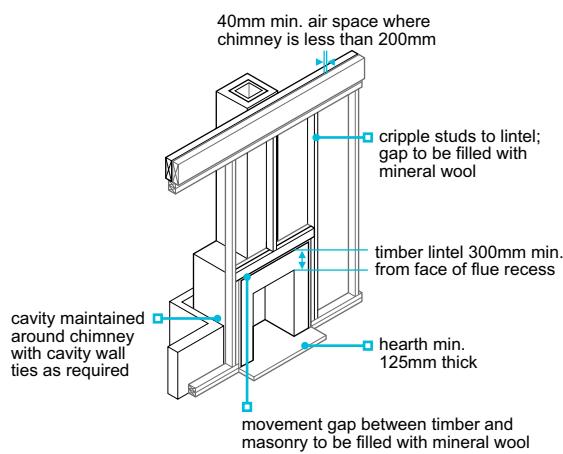


Figure 17: Chimney cavity tray at pitch

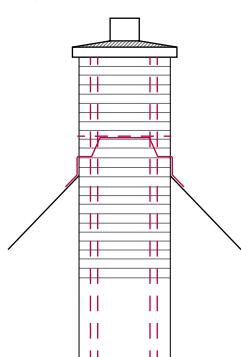


Figure 19: Prefabricated chimney throating

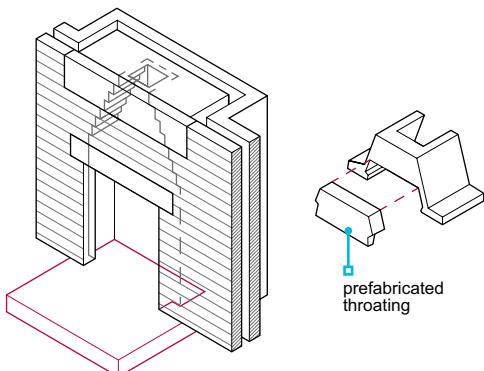


Figure 14: Plan view of chimney at upper floor level — 40mm airspace where non-combustible material <200mm thick

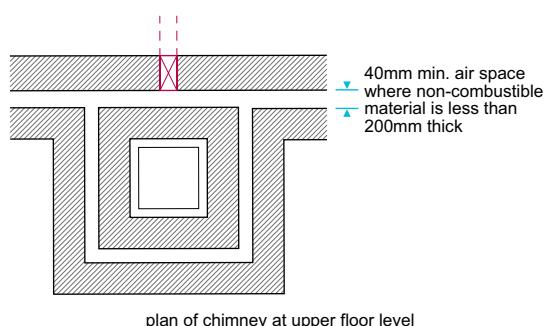


Figure 16: External chimney breast with masonry inner leaf

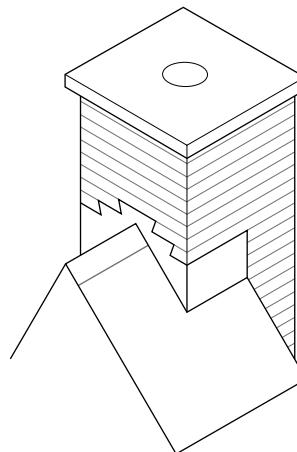
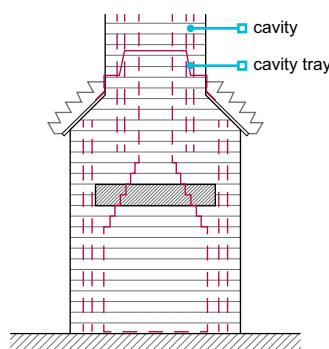


Figure 18: Chimney cavity tray — cross-section (gather)



Other alternatives may be suitable, provided they meet the appropriate performance standards.

6.8.23.3 Damp penetration and weatherproofing

Where chimneys exit close to the ridge of a pitched roof, occasional damp penetration may occur below roof level.

In this situation:

- the roof space should be well ventilated
- any dampness penetrating downwards should not reach the living areas.

Where chimneys exit close to the eaves of a pitched roof or through a flat roof, trays and flashings should be installed in the chimney so that all damp penetration is prevented.

DPCs, flashings and gutters should be provided at the intersection point of the chimney with the surface of the roof through which the chimney passes. DPCs to the main walls should be carried through the base of chimneys.

Flashings should be made from compatible non-ferrous metal. Lead trays should be bitumen coated where in contact with cement.

In areas of severe and very severe exposure, the following figures should be used. In lower exposure zones, the tray upturn may be on the outside of the flue liner. All other details are the same.

Figure 20: Chimney flashing and DPC tray (chimney on outside wall)

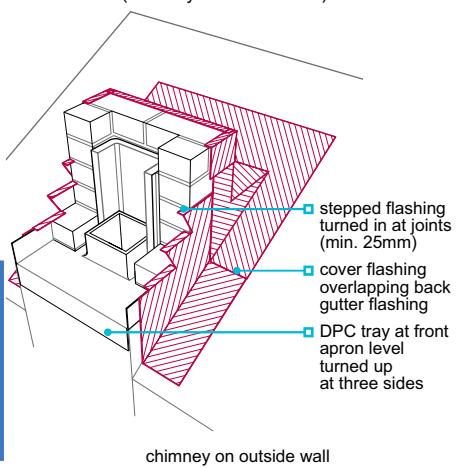


Figure 21: Chimney flashing and DPC tray — stack at ridge

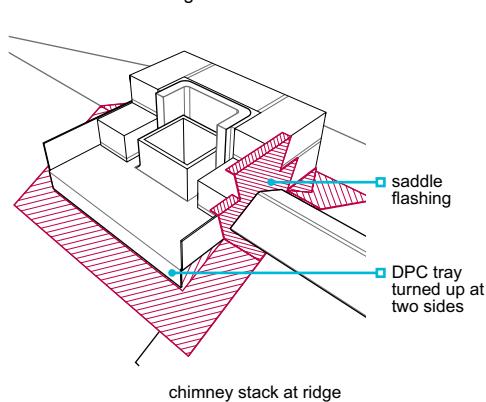
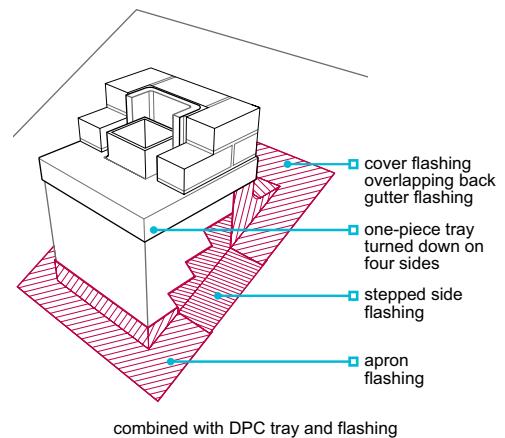


Figure 22: Combined with DPC tray and flashing



6.8.23.4 Coring and drying

Where a core (eg a sack full of loose straw or similar) is used to prevent mortar dropping into the flue liner during construction, the builder should ensure that it is removed on completion of the chimney.

A chimney should be allowed to dry naturally for a minimum period of 14 days before use.

6.8.24 Masonry

Masonry shall be capable of supporting intended loads and have appropriate resistance to the adverse effects of frost and sulfates.

Masonry, including bricks, blocks, stone for masonry and reconstructed stone, should:

- be in accordance with BS 6461 or BS EN 15287-1 and BS EN 771
- where clay bricks are used in external chimney stacks, be of durability rating F2,S1 (as described in BS EN 771) or protected by a projecting capping
- where blocks are used, have a minimum block density of 1,500kg/m³ unless designed by an engineer in accordance with Technical Requirement R5.

In Scotland:

- frost-resistant bricks should be used for all external facing brickwork
- where 100mm blocks are used for chimney construction, they should have a minimum density of 1,500kg/m³.

6.8.25 Mortar

Also see: Chapter 6.1

Mortar shall be batched and mixed to achieve adequate strength and durability.

Mortar should be in accordance with Chapter 6.1 External masonry walls and include sulfate-resisting cement where flue gases are liable to affect the masonry, eg above roof level.

6.8.26 DPC

Materials for damp proofing shall adequately resist the passage of moisture into the building.

The following are acceptable for use as DPCs:

- bitumen to BS 6398
- polyethylene to BS 6515 (not to be used in the chimney stack above roof level)
- proprietary materials assessed in accordance with Technical Requirement R3.

6.8.27 Flashings

Flashings and trays shall be capable of adequately resisting the entry of moisture into the building.

Suitable materials for flashings and trays include:

- milled sheet lead, minimum thickness 1.8mm, code blue (Code 4), to BS EN 12588
- zinc alloy complying to BS EN 988 and 0.6mm thick
- proprietary materials assessed in accordance with Technical Requirement R3.

6.8.28 Terminals

Flue terminals shall be suitable for their purpose and assist the functioning of the flue. Issues to be taken into account include:

1) draught improvement

2) chimney capping.

Relevant standards for flue terminals

BS EN 13502	Chimneys. Requirements and test methods for clay/ceramic flue terminals
BS EN 1858	Chimneys. Components. Concrete flue blocks
BS EN 1856	Chimneys. Requirements for metal chimneys

Terminals should be:

- purpose-made or formed by extending the flue lining a minimum of 20mm above the head of the chimney
- embedded a minimum of 125mm into the chimney, excluding any flaunching, or 0.25x the length of the terminal, whichever is the greater
- the same cross-sectional area as the flue (solid fuel has a minimum requirement of a 200mm diameter).

Figure 23: Purpose made chimney capping (cross-section)

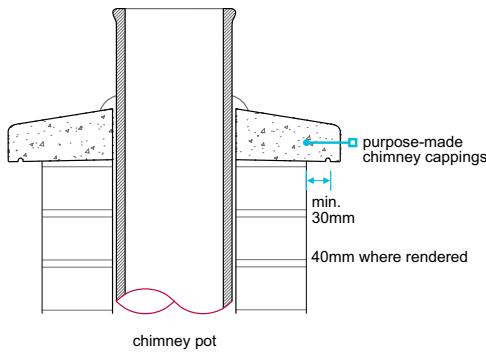
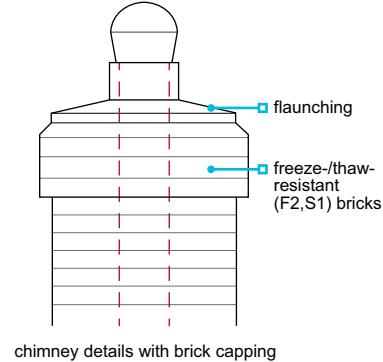


Figure 24: Chimney details with brick capping



The terminal of a masonry flue should be jointed to the flue lining with cement mortar to form a seal.

6.8.28.1 Draught improvement

Where downdraughts may occur, terminals designed to increase updraught should be fitted. However, a terminal will not overcome problems caused by high pressure zones. Where relevant, the Solid Fuel Association or other authoritative body should be consulted.

6.8.28.2 Chimney capping

Where a chimney is to be capped:

- a single unjointed concrete or stone capping should be used
- it should project and be throated to cast water away from the face of the chimney
- a drip at least 30mm from the sides of the chimney, and the withes between flues should be carried to the underside of the slab.

Decorative brick cappings should be carefully constructed to avoid rain penetration and frost damage. The use of frost-resistant bricks may be required.

In Scotland, bricks used for facing brickwork should be frost resistant.

6.8.29 Flue testing

Installations shall be tested before use.

Flues should be checked during construction to ensure:

- there are no obstructions in the flue
- mortar or other blockages are removed.

When the flue is complete, a visual check should be made and obstructions cleared.

6.8.30 Further information

- *BS EN 1856-1 Chimneys — Requirements for metal chimneys — System Chimney products*
- *BS EN 1856-2 Chimneys — Requirements for metal chimneys — Part 2. Metal flue liners and connecting flue pipes*
- *BS EN 1859 Chimneys. Metal chimneys. Test methods*
- *BS EN 15287-1 Chimneys. Design, installation and commissioning — chimneys and connecting flue pipes for non room-sealed combustion appliances*
- *BS EN 15287-2 Chimneys. Design, installation and commissioning — chimneys and connecting flue pipes for room-sealed combustion appliances*
- *BS EN 771 Specification for masonry units*
- *BS 5871 Specification for the installation and maintenance of gas fires, convector heaters, fire/back boilers and decorative fuel effect gas appliances*
- *BS EN 1858 Chimneys. Components. Concrete flue blocks.*
- *BS EN 1806 Chimneys. Clay/ceramic flue blocks for single wall chimneys. Requirements and test methods*
- *BS 5440-1 Chimneys, flue pipes and ventilation for gas appliances of rated input not exceeding 70kW net (1st, 2nd, and 3rd family gases) — Design, installation, commissioning and maintenance of chimneys. Specification*
- *BS 5440-2 Chimneys, flue pipes and ventilation for gas appliances of rated input not exceeding 70kW net (1st, 2nd, and 3rd family gases) — Installation and maintenance of ventilation provision for gas appliances. Specification*
- *IGE/UP/7 Gas installations in timber framed and light steel framed buildings*
- *BS EN 303-1 Heating boilers — Heating boilers with forced draught burners. Terminology, general requirements, testing and marking*
- *BS EN ISO 3506 Fasteners. Mechanical properties of corrosion-resistant stainless steel fasteners*
- *BS 1449 Steel plate, sheet and strip. Carbon and carbon-manganese plate, sheet and strip*
- *BS EN 10088 Stainless steels*
- *BS EN 1443 Chimneys. General requirements*
- *BS EN 1457 Chimneys. Clay/ceramic flue liners*
- *BS 65 Specification for vitrified clay pipes, fittings and ducts, also mechanical joints for use solely with surface water pipes and fittings*
- *BS 6398 Specification for bitumen damp-proof courses for masonry*
- *BS 6515 Specification for polyethylene damp-proof course for masonry*
- *BS EN 988 Zinc and zinc alloys. Specification for rolled flat products for building*
- *BS EN 13502 Chimneys. Requirements and test methods for clay/ceramic flue terminals*
- *BS 5410-1. Code of practice for liquid fuel firing — Installations for space heating and hot water supply purposes for domestic buildings*

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