INTRODUCTION

This publication is intended for Architects, Builders and Designers who propose to use solid fuel heating for domestic buildings. Guidance covers all aspects of design from initial selection of type of appliance and fuel through to chimney design and suitability.

The Solid Fuel Association (SFA)

The Solid Fuel Association offers expert advice to architects and builders on solid fuel, solid fuel heating systems and chimneys.

The Solid Fuel Association has technical personnel who are ready to discuss with, and advise, Architects, Builders and Local Authorities on Solid Fuel heating.

The Solid Fuel Association will give guidance on the most suitable appliances and systems and can arrange installation through a SFA recommended/ HETAS Registered Heating Engineer or competent person for England & Wales. A comprehensive list of these contractors is available on request or can be found on www.hetas.co.uk.

CONTENTS

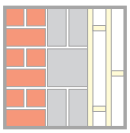
Step by step guide

1. REVIEW DESIGN STRATEGY AND ADVICE AVAILABLE

The design of a solid fuel heating installation should preferably be integrated closely with the design of the dwelling as a whole.
Early decisions and advice on the type of chimney, the appliance recess and its location, the method of fuel storage and heating system will ensure that advantage is taken of the characteristics of solid fuel heating.
The Solid Fuel Association will be pleased to supplement the information and advice given in this guide.

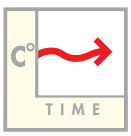
2. CONSIDER SOLID FUEL HEATING AND THE DWELLING AS A WHOLE

CHIMNEY - is needed, centrally placed and straight is best.

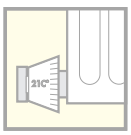


SOLID FUEL HEATING IS SUITABLE FOR ALL FORMS OF CONSTRUCTION - eg brickwork, blockwork, timber frame.

FLUE - provides ventilation and reduces risk of condensation. The chimney acts as a thermal store which helps to even out air temperature variations.



APPLIANCES -burn continuously not intermittently which also helps to reduce large air temperature variations.



CONTROL SYSTEMS - available, can give a high degree of automation similar to other types of fuel: using thermostats, time switches etc.

FUEL STORAGE - location of the store needs to be considered early in the design process.

MAINTENANCE - robust appliances need little maintenance. Flue should be cleaned at least once a year, and access should be easily available.

3. DECIDE HEATING STANDARD

Whole house, Part house, Domestic hot water and Room temperatures.

4. SELECT TYPE OF APPLIANCE

Open fire

Roomheater

Boiler

Cooker with boiler

CONSIDER:

- Output
- Location of appliance in living room, kitchen or utility room
- Freestanding or inset appliance
- Appliance to be installed in new or existing recess.

5. SELECT FUEL

Bituminous

Smokeless, Manufactured and Natural

CONSIDER:
- Type of fuel available for Smoke Control Areas
- Suitability for appliance
- Local availability
- Heating costs of different types of fuel

6. SELECT TYPE OF CHIMNEY

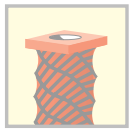
Masonry

Factory made Insulated stainless steel

Factory made: Precast blocks

Location, height and position of outlet

7. USING AN EXISTING CHIMNEY



CONSIDER:
- General condition
- Making good damaged work
- Lining existing chimneys

8. AIR FOR COMBUSTION AND VENTILATION

CONSIDER:
- Ventilation of rooms with solid fuel appliances
- Formation of a good 'throat' between open fire and flue

9. DECIDE ON APPLIANCE POSITION & HEARTH CONSTRUCTION

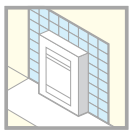
Freestanding

In recess

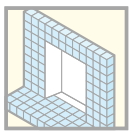
Recommended recess

CONSIDER:
- The construction of the fireproof base for the fireplace and chimney
- The benefits of the recommended recess

10. SELECT OR DESIGN FIREPLACE



With British Standard
or custom built surround



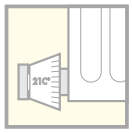
Without surround

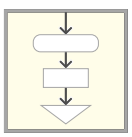
CONSIDER:
- Detailed design and materials
- Siting of fireplace in room eg: are TV viewing and fire gazing compatible?
- Re-use of existing fireplace surround
- Heat protection and easy clean wall surface behind appliance eg: insitu tiling when a surround is not used

11. DESIGN FOR FUEL STORAGE AND ACCESS:

Consider: Access for delivery, capacity and location of store
- Whether integral with house, or integral with other uses such as refuse storage, garage or general storage

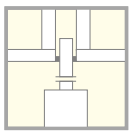
12. DESIGN OR PREPARE BRIEF FOR HEATING SYSTEM DESIGN





- Review characteristics of solid fuel heating systems and controls for energy conservation
- Calculate heat losses for structure and domestic hot water requirements
- Estimate appliance output required and make final selection of appliance and fuel
- Do preliminary heating system design
- Check system layout points eg: Pump and thermostat location, hot water circuit layout, particularly primary circuit feed and expansion system.

13. PREPARE APPLICATION DETAILS



Prepare detailed drawings of fireplace recess, hearth and surround, chimney, flashings, terminal, fuel store etc.

CONSIDER:
- Access for installation and maintenance, eg: use of 'free inset' installation
- Manufacturers installation drawings, and electrical supply requirements
- Connection of appliance to flue
- Ash disposal, chimney sweeping arrangements
- Builders work associated with heating systems installation eg: access to drain cock, ducts for heating pipes and for combustion air

14. PREPARE SPECIFICATION

Decide what work will go in building contract or heating subcontract using specification as an aide-memoire. Adapt specification for method of procurement eg:
- Performance specification or
- Full specification or
- Use as check against specification submitted by SFA Recommended/ HETAS Registered Heating Engineer/ Competant Person.

15. CURRENT BUILDING REGULATIONS

- COMPETENT PERSONS SCHEME Building Regulations Part J for England & Wales state that all appliance installation and associated work is 'building work'. Customers are required to obtain Building Control approval from their local authority or employ an HETAS competent person.

- COMPLIANCE WITH PART L1 ✳ You are advise to refer to sections relating to Target U-valves, System Controls, Insulation and Approval Efficiency.

✳ See our separate guide.

Which type of appliance

SPECIALIST ADVICE

Specialist advice is always available from the Solid Fuel Association. Particular care is needed when selecting a multi-duty appliance, ie one providing one or more heat services such as space and water heating, or cooking and water heating, to ensure each individual heat service is adequate for its purpose.

ROOMS OVER 100M^3

It is not always easy to ensure even distribution of heat through very large rooms (over 100m^3). The shape of the room and the positioning of the appliance must be carefully considered before deciding to use a single appliance even if apparently large enough. Additional emitters such as radiators may be necessary or the use of an appliance with additional warm air ducting.

COOKERS

Many cookers incorporate a boiler suitable for supplying domestic hot water and others provide heat for a radiator based heating system.

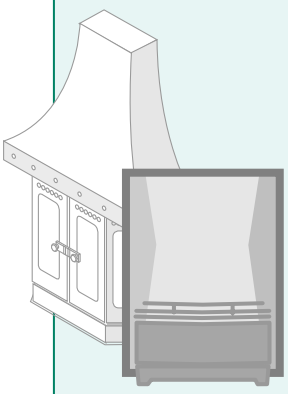
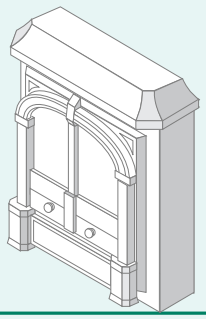
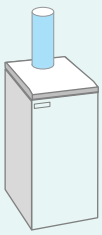
	HEATING AND HOT WATER	OUTPUT
OPEN FIRE 	6 to 7 radiators with high output boilers Small back boilers available for domestic water only plus Room heat Domestic hot water	**Without back boiler** Inset 400mm - 50m^3 Max. room size Inset 450mm - 57m^3 Max. room size Larger models are available Convector 400mm - 64m^3 Max. room size Convector 450mm - 71m^3 Max. room size **With back boiler** Inset 400mm - 42m^3 Max. room size Inset 450mm - 50m^3 Max. room size With adjustable throat + 7m^3 to room size Direct room capacities range from 1.2 to 3.1 kW and boiler outputs from 2.9 to 10.1kW
ROOM HEATER 	Up to 9 or 10 radiators plus Room heat Domestic hot water	**Non Boiler Models** up to 15 kW direct room heating **Domestic Boiler Models** Room outputs up to 13kw with boilers for hot water and towel rail High output boiler models upto 12.7kw to boiler plus direct room heating
BOILERS (AND COOKERS WITH BOILERS) 	As many radiators as required plus Domestic hot water • Up to 10 radiators for cookers	3.5kW to 40kW Gravity feed boilers from 13kW to 24 kW. Cookers 3kW to 22kW.

Fig 1

OUTPUT

Guidance is given in Guide 3.4 HETAS Official Guide to Approved Solid Fuel Products & Services, and below, on the selection of an open fire of a suitable size to heat a room effectively. For roomheaters and open fires with high output back boilers rated output is given in kW for both:

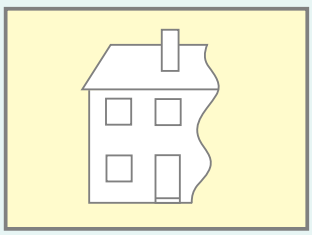
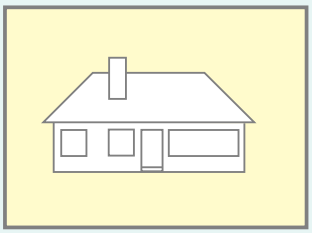
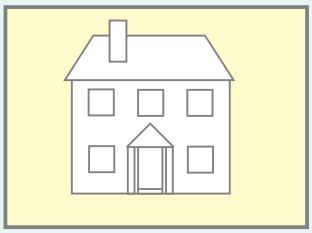
- The direct room heat provided by radiation (and convection)
- Hot water from the boiler which is available for domestic use and/or radiators

Outputs for some appliances are given when the damper is closed and when open.

It should be appreciated that the heat output of an appliance will depend upon the conditions under which it is used. Even burning and avoidance of "racing" will provide the best service with high reliability. With this in mind the ratings set out in Guide 3.4 are based on reasonable burning rates in the home.

A considerable amount of useful heat additional to that shown in Guide 3.4 is available from the chimney serving an appliance. This can vary from as much as 9 per cent of the input for a roomheater without boiler, to 3 per cent for other appliances depending on the type of house and whether the chimney is built on an inside or an outside wall.

The object of rating is to ensure, as far as possible, that under normal conditions of domestic use, and burning one or other of the fuels shown as suitable, the appliance will give satisfactory heat service. The outputs shown are those which should not normally be exceeded.

FEATURES	CONTROLS AVAILABLE	TYPES OF FUEL	TYPICAL APPLICATION
• Overnight burning possible • Fire visible • Radiant heat on some models • Deep ashpits on some models with less frequent ash removal	Manual controls Fan assisted fires may be connected to thermostat or time switch Cylinder thermostat is connected to a circulating pump on the heating system	Housecoal Smokeless	3 Bed terrace or Semi Detached House 
• Fire visible behind glass • Can still provide domestic hot water when "idling" • Radiant and convected heat	Roomheaters and boilers having water sensing thermostats can be used with  Room thermostats  Radiator thermostats  Cylinder thermostats  Time switches  Motorised valves  Outside sensors	Smokeless Housecoal on Multi-Fuel	As above plus 2-3 bed Bungalow 
• Mechanical and Gravity feed models require infrequent refuelling and de-ashing • Additional space heating from boiler and flue		Smokeless Some cookers and boilers burn Housecoal	All above plus 4-5 bed Detatched House 

Open Fires

There are two types of open fire: the 'dry' type (Fig.2) and those with boilers which provide hot water for domestic and heating use. The boiler types (Fig.3) have rated outputs from 2.9 to 10.1kW.

Open fires may burn Housecoal and many Smokeless Fuels, although some of the denser fuels will need underfloor or fan assisted draught.

Open fires can be classified according to the main methods of installation as follows:

INSET
- At hearth level
- Hole-in-the-wall
- Deep ashpit
- Covector

CONVECTOR
- Freestanding
- Inset

A range of hole-in-the-wall designs can be supplied or built insitu. In Fig. 4 we show a raised hearth type with a deep ash pit and under-floor draught.

Inset open fire: non boiler (at hearth level)

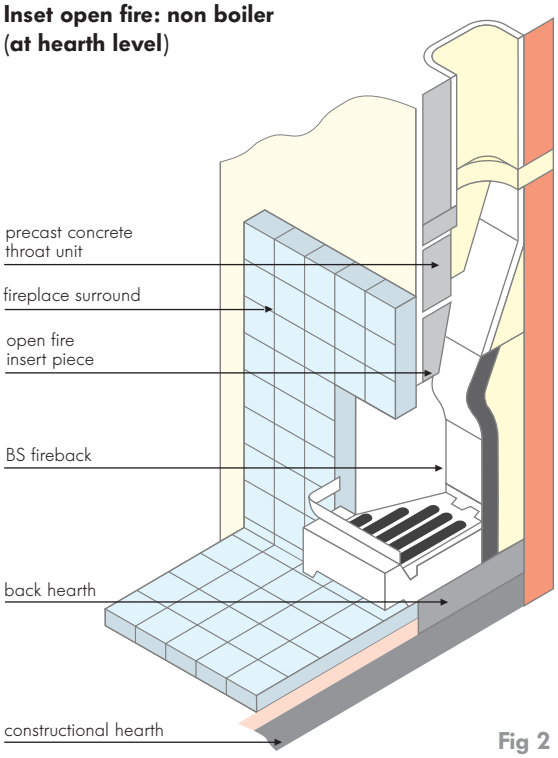


Fig 2

Inset open fire with back boiler (at hearth level)

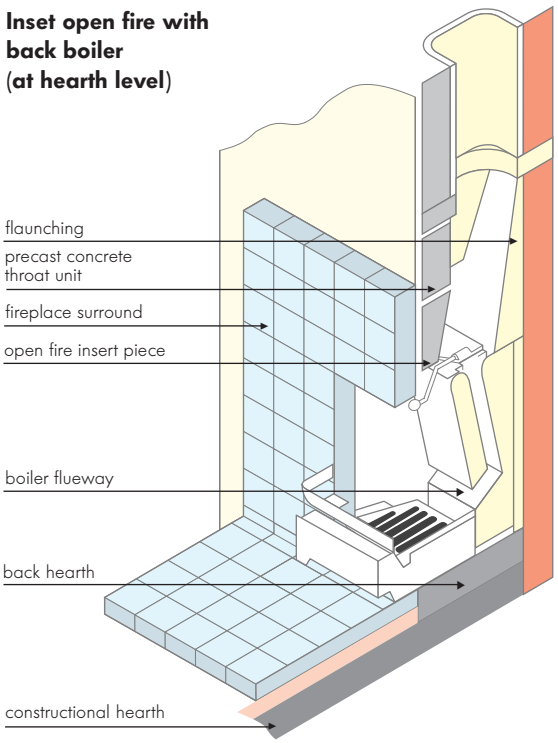


Fig 3

Inset open fire with deep ashpit and underfloor draught, raised hearth

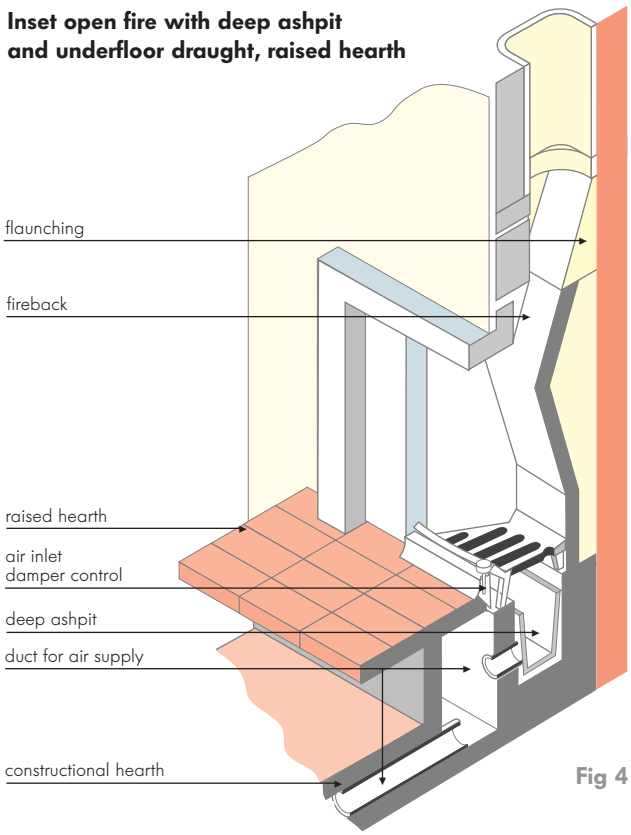


Fig 4

Inset open fire with deep ashpit and underfloor draught

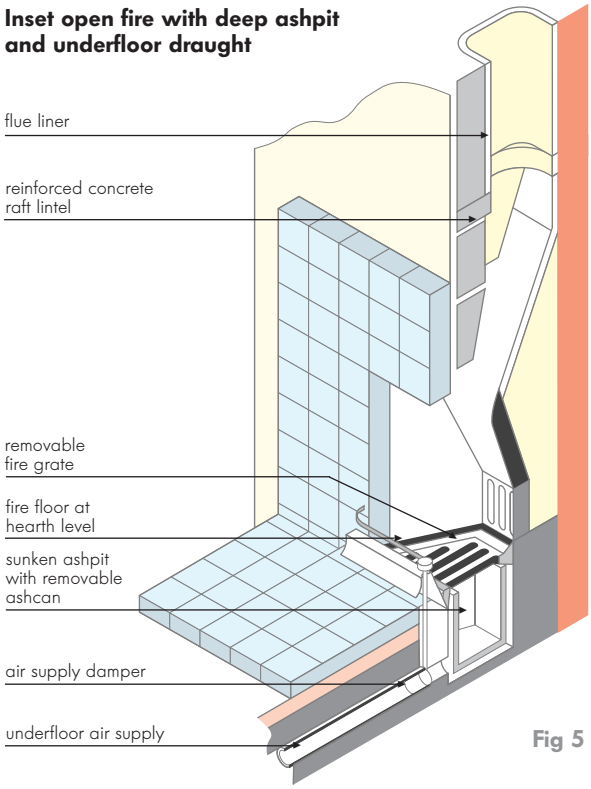


Fig 5

In most cases fires with underfloor air supply for combustion have little or no firefront above hearth level. The bottom grate is at, or slightly below, hearth level, and normally a large capacity ashcan is housed in a deep ashpit below hearth level. Combustion air is brought by duct into the ashpit. (Fig. 5)

Normally large ashcans only need emptying about every third day of continuous burning.

The installation of underfloor ducts will need to be considered early in the design, in particular the entry points in relation to external ground level.

Duct entries and grilles for the underfloor air supply must not connect with the cavity in the external wall.

Underfloor duct

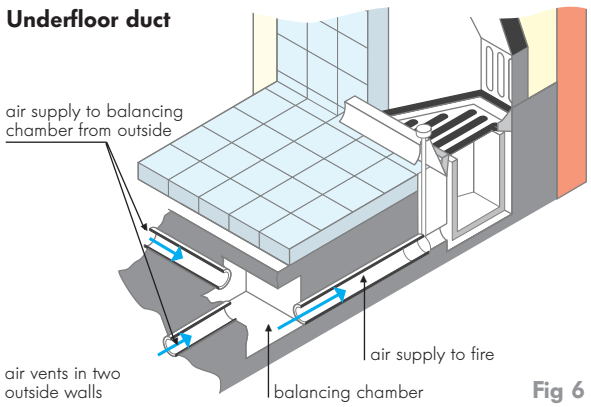


Fig 6

With a solid floor, it is necessary to construct ducts, either directly in the concrete or by laying pipes from outside walls. It is advisable to use ducts from at least two walls, preferably at right angles, meeting in a balancing chamber from which a short duct runs to the air inlet connection. The balancing chamber is to prevent a through-draught of air exerting a suction effect on the fire. (Fig. 6)

With a suspended ground floor, it is usually sufficient to connect the inlet pipe to the underfloor air space by a short length of pipe. Ascertain that free ventilation of this space (eg through the sleeper walls) is possible and that the air bricks on the outside walls are not blocked and comply with the relevant Building Regulations.

Outside ashcans

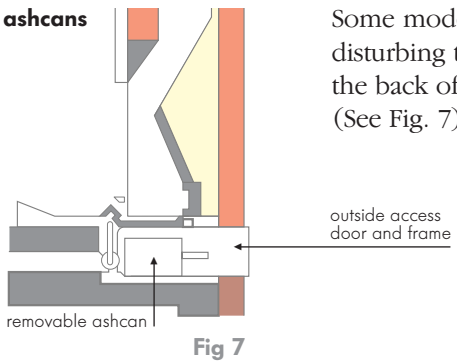


Fig 7

Some models enable ash to be removed without disturbing the fire, by incorporating an access door at the back of the fireplace accessible from outside. (See Fig. 7)

Convector open fire inset

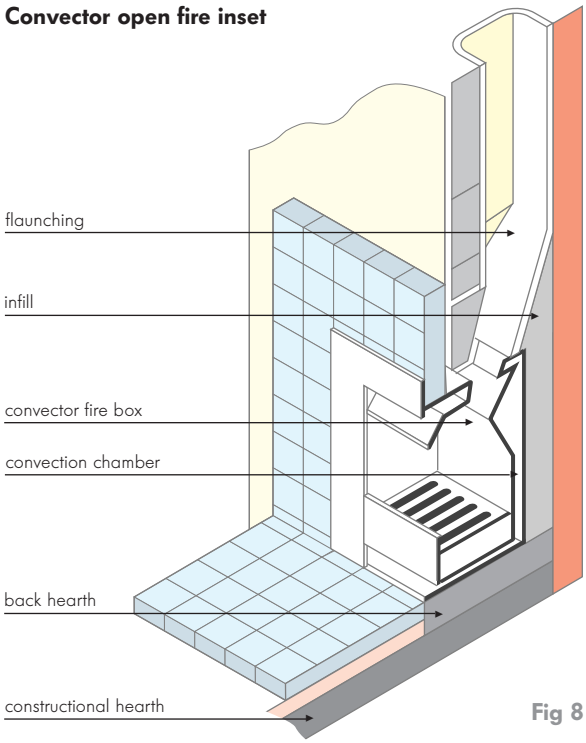


Fig 8

Illustrated in Fig. 8 is a double skinned firebox inset into the chimney breast to replace the usual British Standard Fireback. This type of appliance can give outputs ranging from 2.9 to 6.6kW while providing radiant and convected heat. These fires are useful in larger rooms where convected air heats a larger volume.

Convector open fire, freestanding

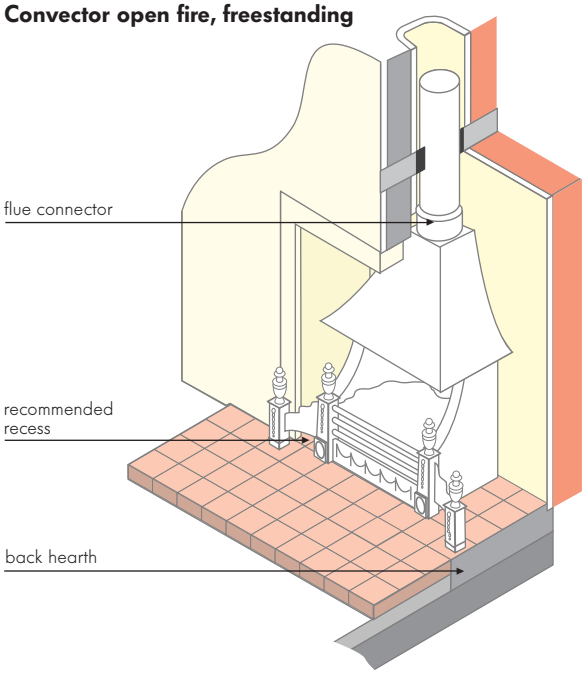


Fig 9

Freestanding convector fires (Fig.9 and 10) heat a larger volume of air by convection than inset fires. They are usually vented directly to the chimney with a flue connector.

Other convector

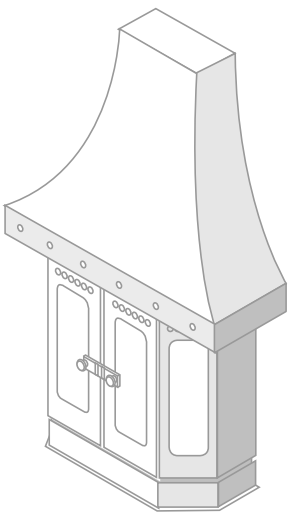


Fig 10

Roomheaters and Multi-Fuel Stoves

Stand-in roomheater with surround seal utilising an existing fireback (non boiler model)

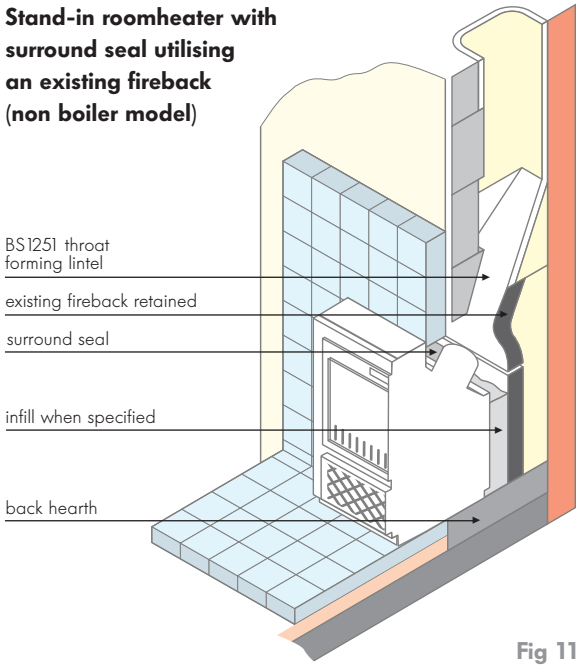


Fig 11

Stand-in roomheater with chimney seal, utilising existing recess (boiler model)

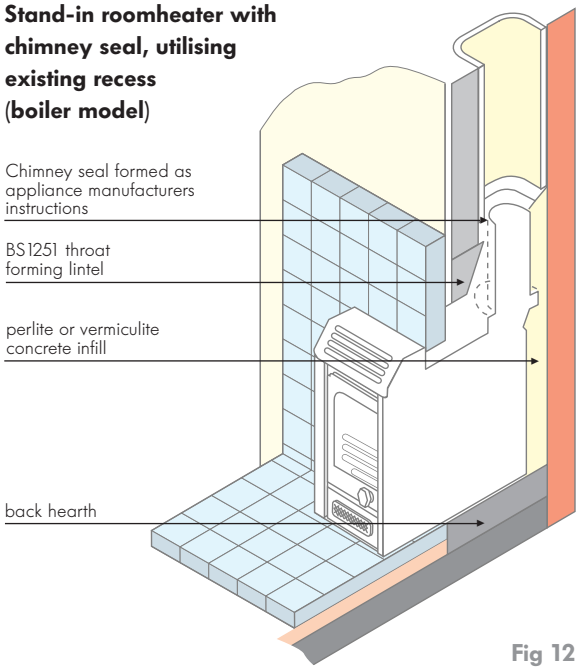


Fig 12

There are two types of roomheater. The 'dry' type and those with boilers which provide hot water for heating and domestic use. The boiler types have rated outputs from 3kW to 13kW.

Most roomheaters burn a range of smokeless fuels. Some burn selected housecoal or are multi-fuel. The burning of housecoal or wood is not permitted in smoke control areas, unless the appliance has a specific exemption

The fire is visible through a glazed door which is generally used for refuelling.

The chimney can normally be cleaned through the appliance.

Currently there are both boiler and non-boiler models available for all four types of appliance covered in this secion

These appliances can be classified according to the four principal methods of installation as follows.

STAND-IN ROOMHEATERS with SURROUND SEAL UTILISING AN EXISTING FIREBACK OR RECESS

These roomheaters can be installed in most existing fireback and fireplace surrounds.(fig 11)

Some models utilise the space between the appliance and fireback as a convection chamber. When this space is not used as a convection chamber it is filled with vermiculite concrete.

STAND-IN ROOMHEATERS with CHIMNEY SEAL

These models require the omission of the fireback and the stand in unit is fitted into the recess. The unit requires a flue connector, sometimes offset, between the appliance outlet and chimney. (fig 12)

Stand-in roomheater with chimney seal: 'free inset' application

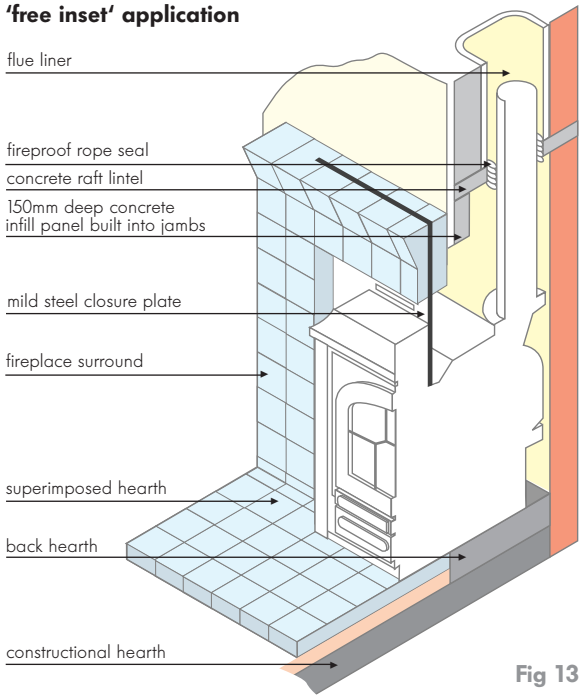


Fig 13

STAND-IN ROOMHEATERS WITH CHIMNEY SEAL: 'FREE INSET' APPLICATION

These roomheaters are located within the fireplace recess and are sealed directly to the chimney with a length of flue pipe, through a purpose made lintel.

A non-combustible panel (closure plate) is inserted between the fireplace surround and the appliance.

Fig. 13 illustrates use of a sliding steel panel technique known as the 'free inset' application.

The panel has openings which convert the recess into a convection chamber allowing circulation of warmed air into the room.

This type of appliance and installation gives good access for maintenance.

Freestanding roomheater with exposed top flue outlet

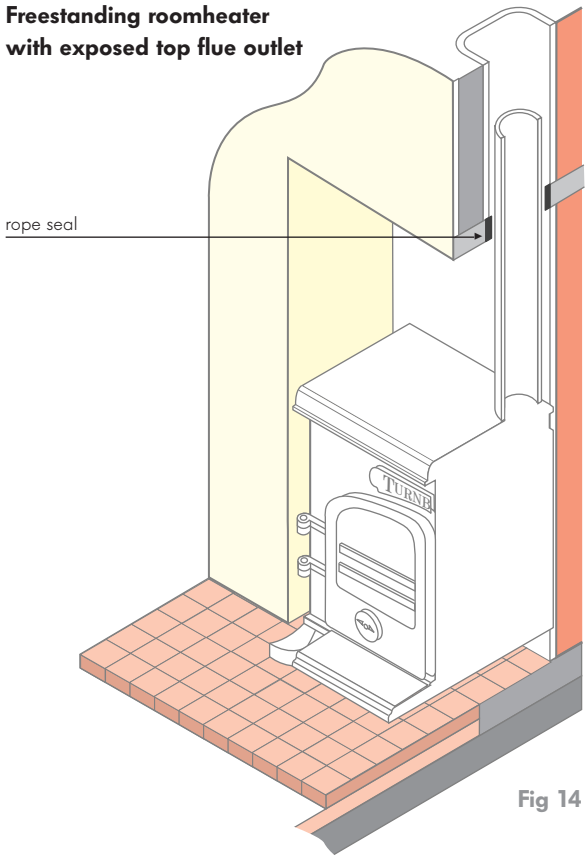


Fig 14

FREESTANDING ROOMHEATER (WITH TOP FLUE OUTLET PIPE CONNECTION TO CHIMNEY)

These roomheaters are connected directly to the chimney with an exposed length of pipe. (Fig.14)

They are easy to maintain.

They heat a larger volume of air by convection than other types of installation.

Freestanding roomheater with top flue outlet and housed in a prefabricated chest

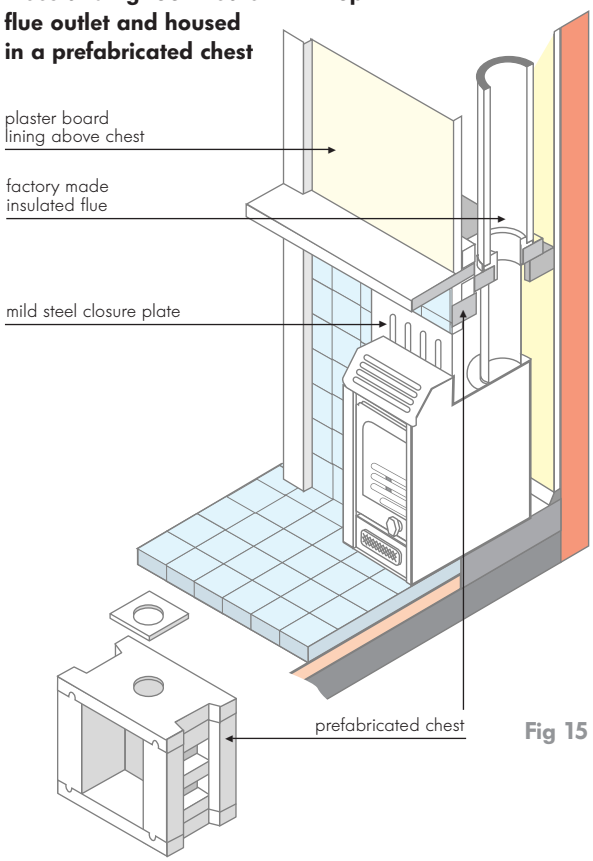


Fig 15

USING FACTORY MADE CHEST AND FLUE

A factory made chest can be used to form the appliance recess and support for a factory made chimney. See Fig. 15.

Most designers box in the space above the chest which contains the chimney. The chest and chimney should be from the same manufacturer and must be suitable for use with solid fuel appliances.

Freestanding roomheaters

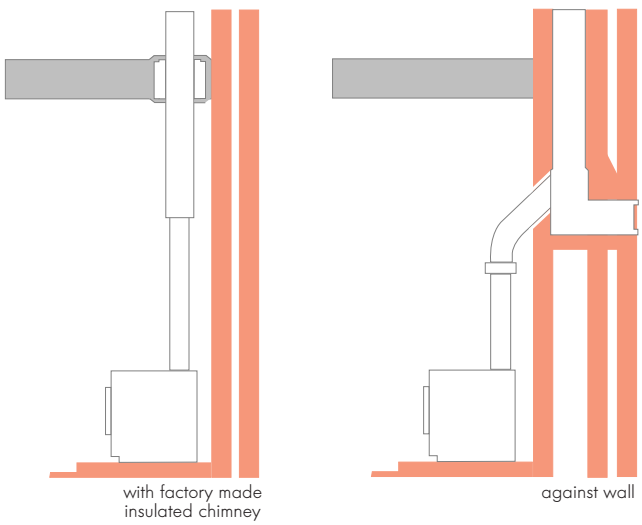


Fig 16

INSTALLED WITHOUT A RECESS

Freestanding top flue outlet roomheaters are also used without the usual appliance recess. See Fig. 16.

If a prefabricated chimney is to be used it must conform to BS4543. The manufacturers literature should be consulted to ensure its suitability for use with all the fuels suitable for the appliance to be installed. See page 21, Fig. 32.

Freestanding roomheater with back flue connection utilising existing fireback

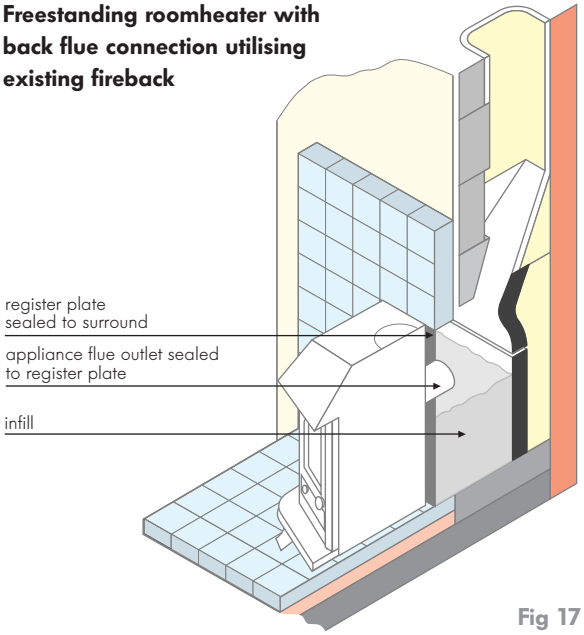


Fig 17

FREESTANDING ROOMHEATERS (BACK FLUE CONNECTIONS)

These appliances heat a large volume of air by convection. For appliances with a back flue connection the chimney is cleaned either by withdrawal of the appliance or from a soot door in the chimney. See Figs. 17. & 19. Note, horizontal flue section's should not exceed 150mm in length.

As the chimney seal is formed by the connections of the appliance and surround to the register plate, good detailing is required and reference should be made to the appliance manufacturers installation instructions.

The type of appliances shown in Figs. 18 & 19 can also be fitted into an existing fireplace surround using a register plate as in Fig. 17.

Freestanding roomheater in recess with back flue connection

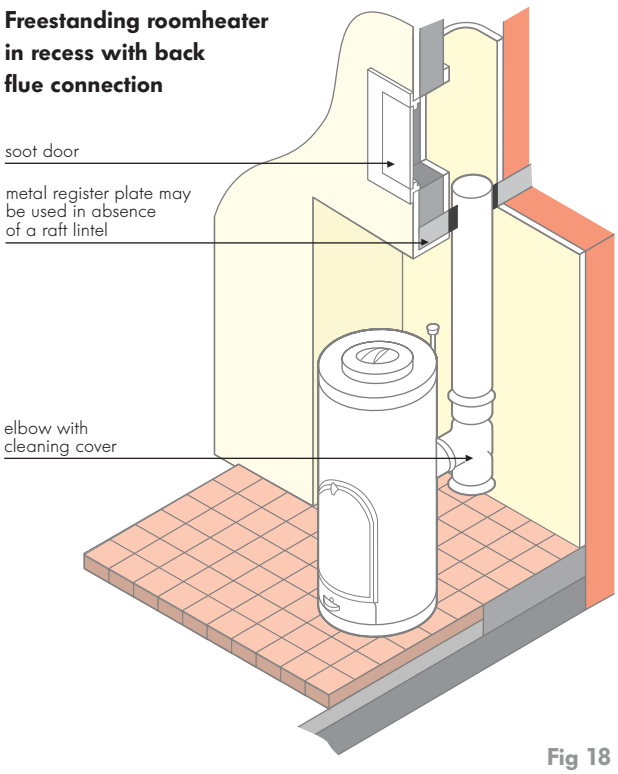


Fig 18

Freestanding roomheater with back flue connection

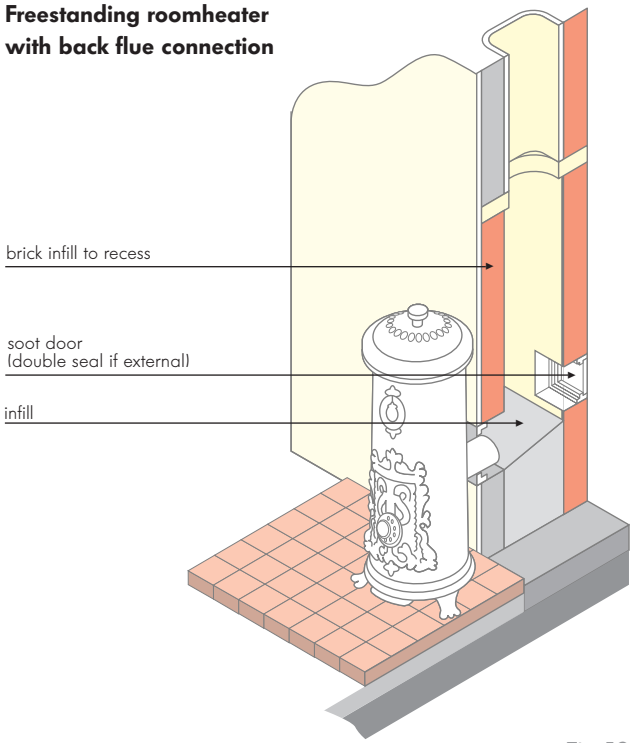


Fig 19

Boilers and Cookers with Boilers

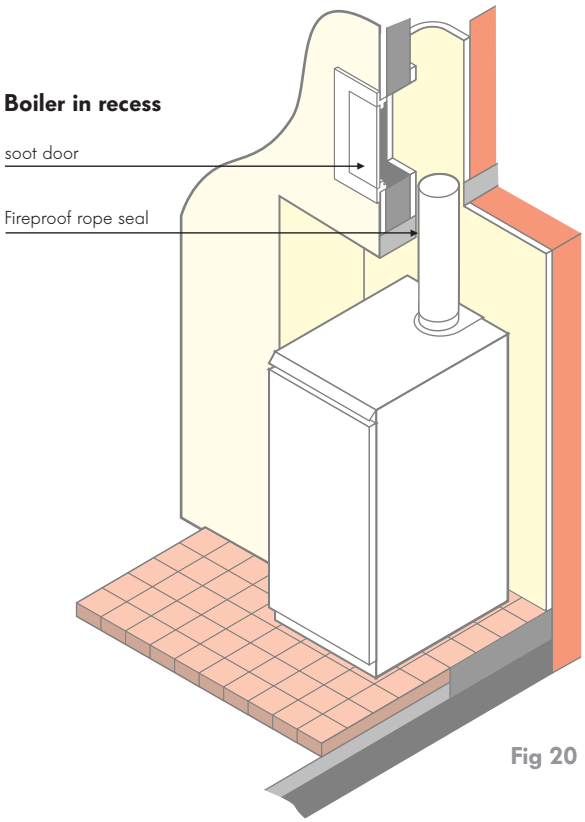


Fig 20

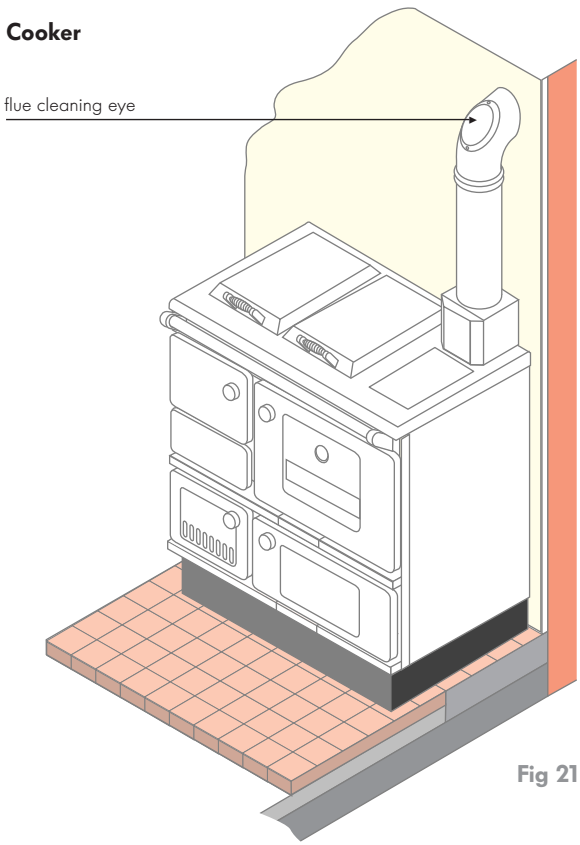


Fig 21

Most boilers and cookers can burn a range of fuels and are suitable for use in Smoke Control Areas. Gravity feed boilers offer infrequent refuelling and semi-automatic de-ashing.

Batch fed boilers allow a wide range of fuels to be burnt and some are multi-fuel. They can burn coal or wood if installed in a Non-Smoke Control Area.

The range of rated outputs for boilers in the current HETAS Approved List of appliancies (Guide 3.4) is very wide starting at 3.5kW and going up to 40kW.

All models are installed as freestanding; typically with a top outlet flue (Fig 20) although a back outlet is available in some models.

The exposed length of flue is usually in enamelled cast iron with a cleaning eye on the bend as in Fig. 21 (fully vitreous enamelled mild steel flue pipe is sometimes used).

Most cookers have boilers suitable for heating domestic hot water, some can heat radiators as well.

Some cookers are insulated to maintain a more even temperature from a smaller heat source.

If a draught stabiliser is not incorporated in the appliance then a combined soot door and stabiliser may be required. This must be fitted internally and applies in particular to independent gravity feed boilers.

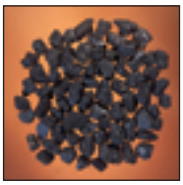
Selection of Solid Fuels


Cobbles


Doubles


Wildfire


Anthracite Nuts


Anthracite Beans


Coalite


Cosycoke


Phurnacite


Pureheat

• Early consideration of the type of solid fuel to be used is essential. Factors are:
1. AVAILABILITY.
2. WHETHER APPLIANCE WILL BE IN A SMOKE CONTROL AREA.
3. WHETHER FUEL IS SUITABLE FOR APPLIANCE TYPE.

• Advice is available from the Solid Fuel Association and the list below shows types of fuel suitable for the main types of appliance. When selecting the actual appliance, reference to suitable fuels can be made using the HETAS Official Guide to Approved Solid Fuel Products and Services, (Guide 3.4)

• Most of the appliances listed will burn a wide range of fuels, although some are designed to burn a specific type. The appropriate Fuel Producers or Distributors should be consulted to ensure suitable fuel for the appliance is available.

• In Smoke Control Areas only authorised smokeless fuels may be used, unless the appliance has a specific exemption.

• There are two broad categories of solid fuels available in the United Kingdom: natural fuel and manufactured fuel. Natural fuels are taken from the ground, washed and graded for size. Manufactured fuels are processed to produce particular characteristics and are usually smokeless.

• Generally, when burning solid smokeless fuels, up to one third more heat is obtained than when burning the same weight of Housecoal. This usually results in Housecoal being burnt at a higher rate to achieve the same heat level required by the householder.

SUITABLE FUELS FOR DIFFERENT APPLIANCE TYPES
For further advice, on all appliances, contact the Solid Fuel Association.

OPEN FIRES
Housecoals & coal briquettes (except in smoke control areas) and manufactured smokeless fuels suitable for open fires.

OPEN FIRES WITH FAN ASSISTED OR UNDERFLOOR DRAUGHT
(As above plus most closed appliance fuels).

CLOSED APPLIANCES (Roomheaters, Cookers & Independent Boilers - not gravity feed)
Anthracite large and small nuts and manufactured smokeless fuels suitable for closed appliances.

MULTI-FUEL STOVES
Housecoals & coal briquettes (except in smoke control areas), manufactured open fire fuels, anthracite large and small nuts and manufactured smokeless fuels for closed appliances depending on appliance size.

GRAVITY FEED BOILERS & ROOMHEATERS
Anthracite beans, peas & grains plus hard coke boiler beans.

DOMESTIC UNDERFEED STOKERS
Coalflow Pearls (or selected washed bituminous coal singles - as specified by the Appliance Manufacturer).

Chimneys

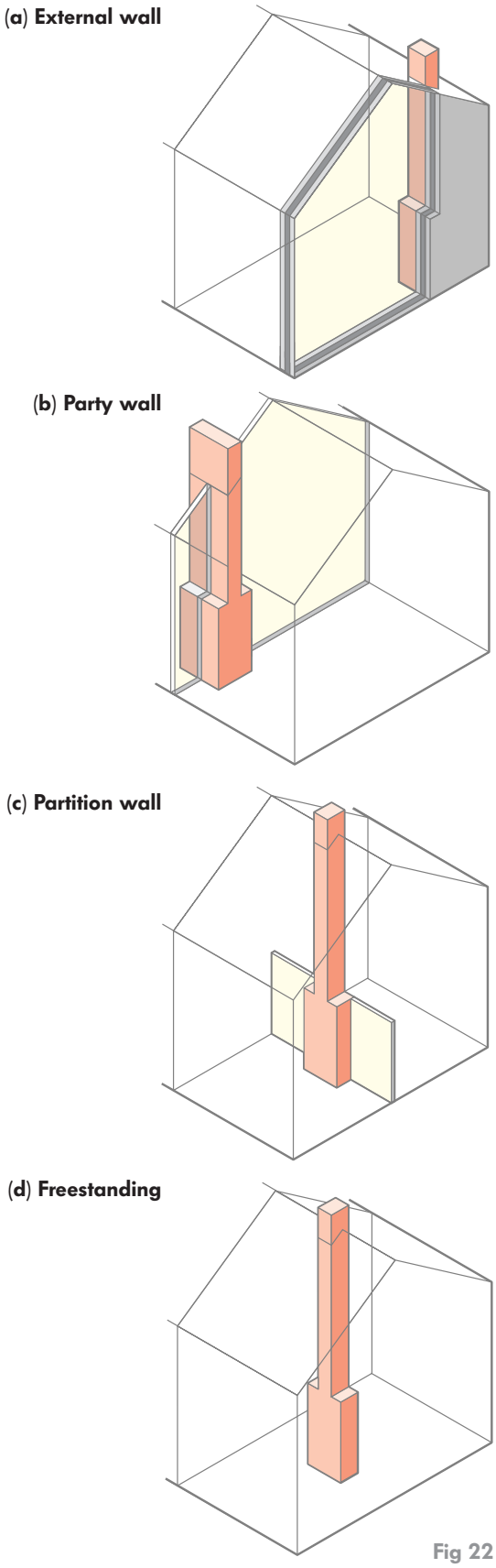


Fig 22

The best position to site a chimney is in the centre of a dwelling where the maximum use can be made of its heat storage and ventilation characteristics. Fig. 22 (c &d).

The appliance recess and its associated chimney can be sited on an external wall, a party wall, an internal partition wall or be freestanding as illustrated in Fig. 22. The position of the appliance recess and the method of construction determines the thickness of wall at the back of the recess.

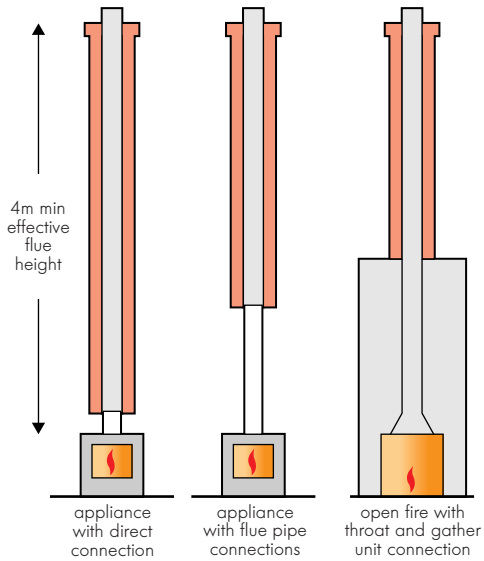


Fig 23

The main function of a chimney is to induce an adequate supply of combustion air and to remove the products of combustion produced by the appliance. Additionally the flue induces a flow of ventilation air which also assist in the prevention of condensation in the dwelling.

As a general rule, the minimum effective flue height of a chimney serving domestic appliances should be not less than 4m measured vertically from the outlet of the appliance to the top of the flue terminal as shown in Fig. 23.

Generally the most efficient chimney is one that is straight, avoids offsets and terminates with a straight-sided pot no smaller than the flue size.

Flue offset angle

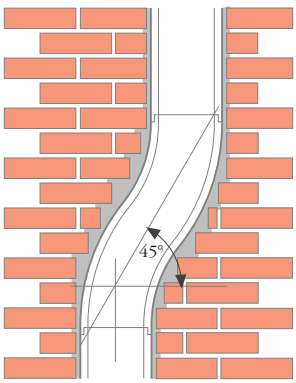
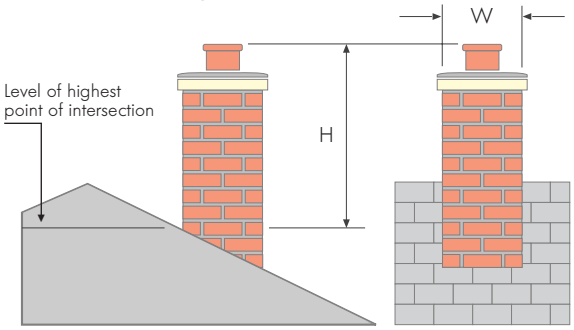


Fig 24

If it is necessary to offset the chimney the statutory minimum is 45° to the horizontal as illustrated in Fig. 24.

Chimney stack height



H should not exceed 4.5xW Note: W is the least horizontal dimension of the highest point of intersection with roof surface, gutter etc, and H is measured to top of any chimney pot or terminal

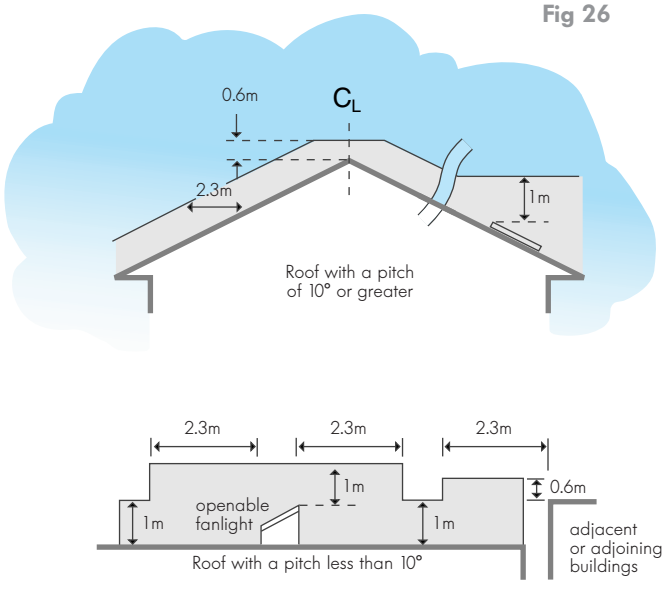
Fig 25

For structural stability, the height of a chimney stack (i.e. the height above the roof opening of a building which includes the chimney terminal) should not exceed 4.5 times its minimum horizontal width. See Fig. 25.

Where the stack is adequately stayed, the height above the stay should not exceed this value. Where staying of chimneys is necessary a band should be closely clamped to the stack for the purpose of attaching stays.

Stays should be of stainless steel or non-ferrous material. They should be of a cross-sectional area adequate for sustaining a safe load equal to that on the face of the chimney opposite to the stay when acted upon by a wind pressure as calculated in CP3: 'Code of basic data for the design of buildings - Chapter V, Loading: Part 2, Wind Loads.'

Fig 26



Flue outlet should terminate outside the shaded area

In England and Wales the regulations for the termination of flue outlets are given in Document J of the Building Regulations. Fig. 26 shows the Regulations. Further guidance can be viewed on Page 26, diagram 2.1 of Approved Document J for England & Wales and Page 25, diagram 1 of Approved Document F in Scotland.

Downdraught

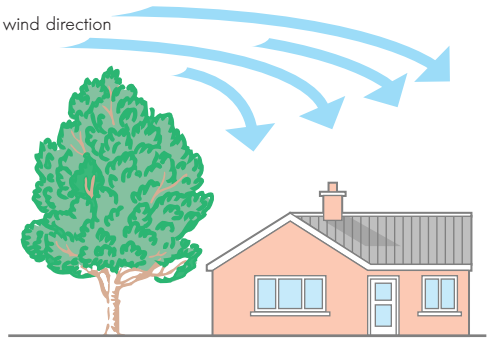


Fig 27

However well designed, constructed and positioned, the satisfactory performance of a flue can be adversely affected by downdraught caused by nearby hills, adjacent tall buildings or trees. These can deflect wind to blow directly down a flue or create a region of turbulence over the terminal.

In this situation, wind blowing over another tall building, tree or hill, descends onto the chimney top, causing a puff of smoke or fumes in the room, usually intermittently. See Fig. 27.

Pressure zone

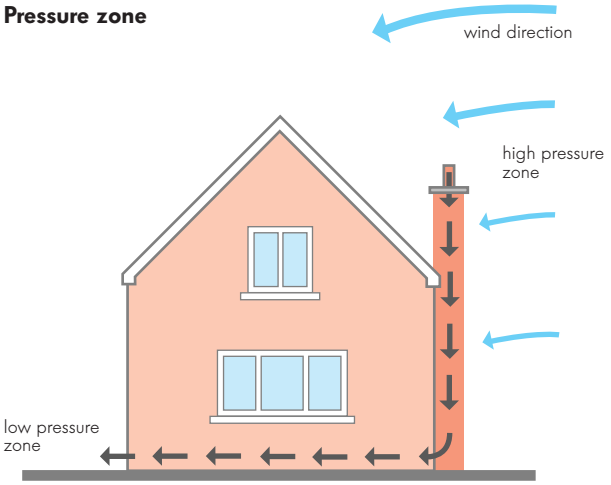


Fig 28

Fig. 28 shows a chimney sited in the line of the prevailing wind, with a taller object, house, roof, tree or nearby hill behind the chimney terminal. This can cause a pressure zone and puffing or continuous fume emission when the wind is blowing.

local wind conditions and chimney performance on a roof pitch > 30°

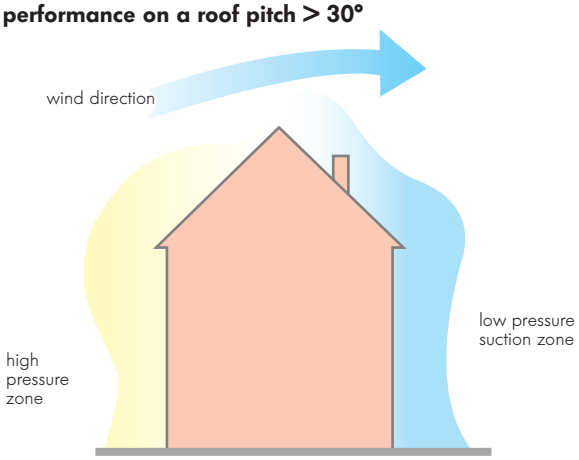


Fig 29

For a high pitched roof, (>30°) the pressure on the windward side is greater than on its leeward side. See Fig. 29. A flue outlet located in this high pressure zone (Fig.30) may cause fume emission from an appliance it serves unless the outlet is raised above the high pressure zone or placed on the leeward slope in the suction zone.

For further information on wind effects on flues and suggested tests and solutions see Guide 3.3 (Guide to Curing Chimney Problems)

The effect of openings on smoke emission

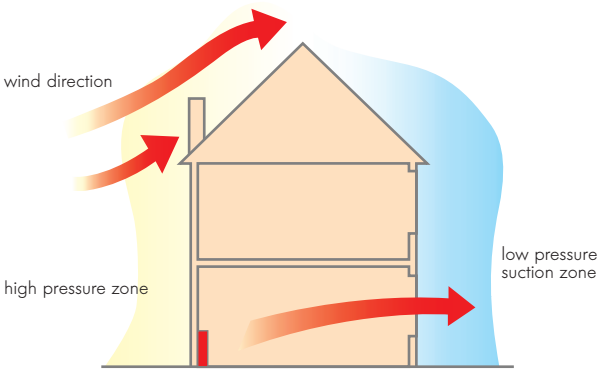


Fig 30

If the room in which the flue originates communicates by way of windows or other openings with the suction zone, (Fig 30) the possibility of appliance smoke emission will be increased.

Therefore, for a high pitched roof it is desirable that a chimney placed on the windward slope is located as near to the ridge as possible, where a reduced air pressure exists.

For a low pitched, ($<30^0$), or a flat roof, the positioning of the chimney is not so critical and the effect of wind may be largely ignored.

Masonry chimneys

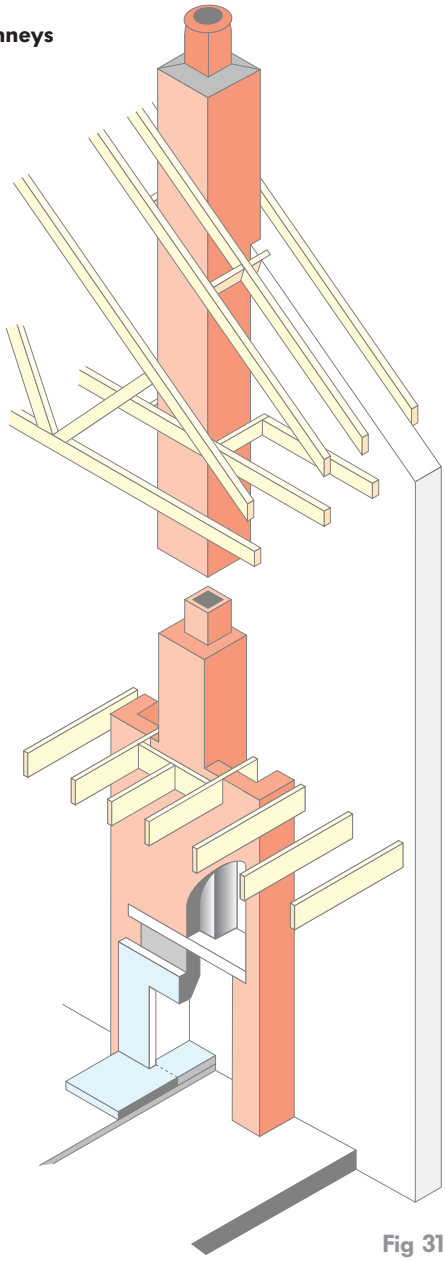


Fig 31

MASONRY CHIMNEYS (Fig.31)

The flue through the chimney should be formed with circular or square section liners with parallel sides and surrounded with 100mm of solid non-combustible material. Flues may be lined with vitrified clay, salt glazed ware, or precast linings as specified in the Building Regulations. Any gap between the liner and the surrounding masonry must be filled with insulating cement.

Liners which are manufacturd with sockets must be fitted with sockets uppermost and cement jointed with fire resistant mortar.

It is recommended the minimum internal dimensions should be 185mm square or 200mm diameter round. This size of flue is suitable for open fires in surrounds with fire openings up to approximately 500mm wide x 550mm high, as well as for roomheaters, stoves and boilers. If an offset is present in the flue then these dimensions should be increased by 25mm.

Factory made insulated

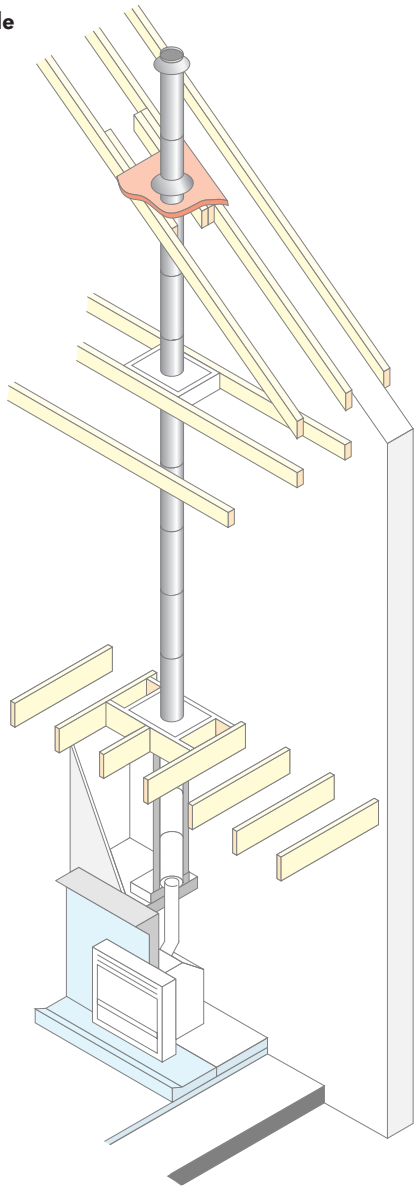


Fig 32

FACTORY MADE INSULATED CHIMNEYS

These are easy to install in both existing and new houses. They are fully insulated with metal or ceramic liners to ensure even temperatures throughout the length of the flue.

Factory made chimneys can be installed internally, (fig 32) where they have the advantage of taking up less space than brick built chimneys, or externally. As well as being designed to British Standards, most makes also have an Agrément Certificate or BSI Kitemark.

They are frequently used in conjunction with factory made fireplace recesses known as 'chests', which support the base of the chimney. In some applications the chimneys are supported by first floor joists and connect to a ground floor appliance by a vitreous enamel pipe. The size of these flues still have to conform to the current Building Regulations.

FACTORY MADE PRECAST BLOCK BUILT CHIMNEYS

Precast concrete blocks incorporating a flue way for building into brick or block walls, or freestanding over limited heights. These lightweight units are easy to handle and therefore can offer a reduction in the cost of installing a chimney in a new house. The sections are designed to fit together and require only a small amount of mortar to provide an airtight joint. The minimum dressing to the finished chimney is a cement wash although the chimney can be brick clad above the roof level. (fig 33)

Factory made precast block built

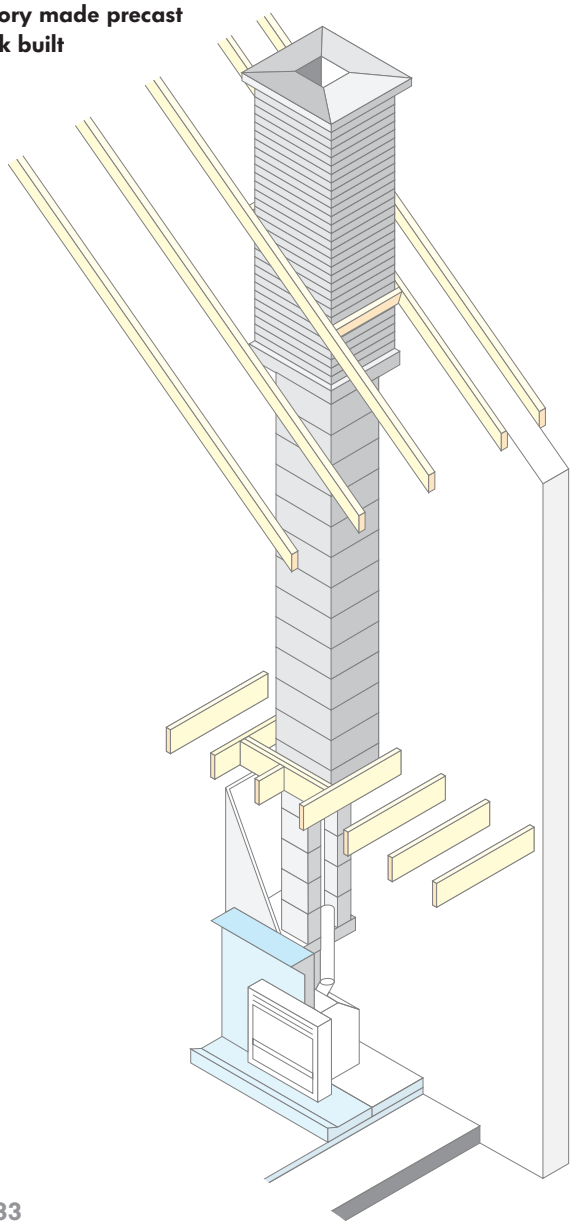


Fig 33

Using existing chimneys

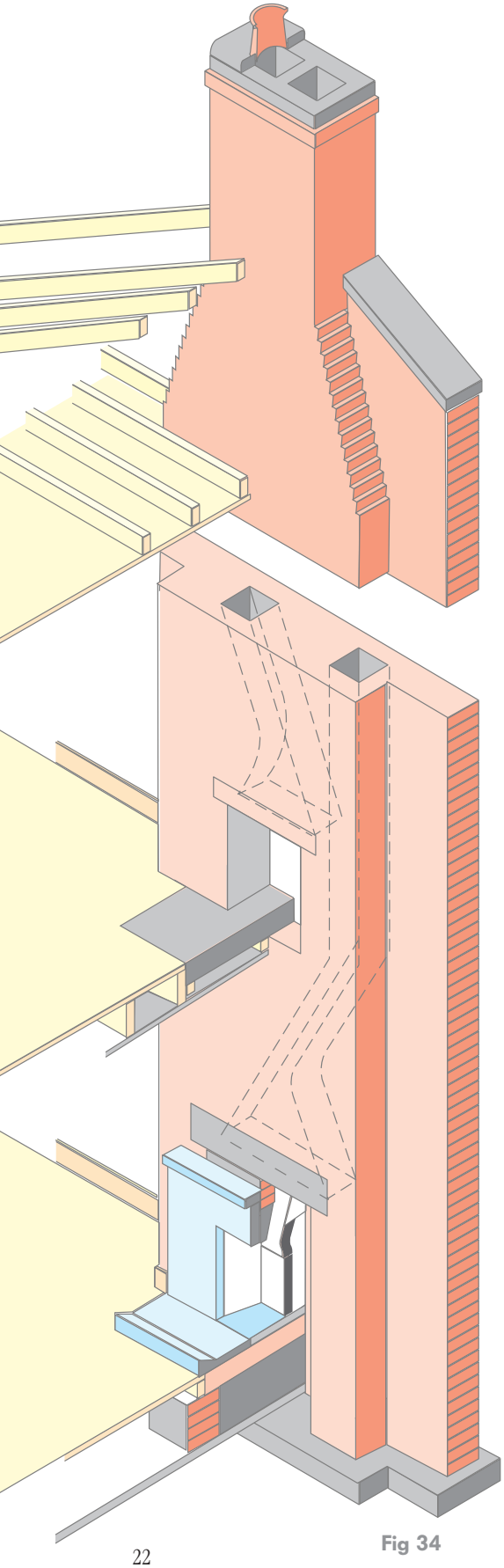


Fig 34

When repairing or bringing back into use an existing chimney (Fig.34) the best approach is to follow, wherever practicable, advice for new construction. It is always advisable to seek a Building Control Officers guidance before altering any flues.

BUILDING REGULATION REQUIREMENTS

A chimney liner does not have to be fitted to a chimney erected before the following Building Regulations came into effect: in England and Wales the Building Regulations February 1966, in Scotland the Building Standards (Scotland) Regulations June 1963. This exemption still applies even when there is a change of appliance, unless the chimney fails a smoke test. Chimneys erected after these Regulations came into force must be fitted with a liner. Alterations to existing chimneys, including relining, now come under Building Control and anyone wishing to undertake work will need to seek approval from their local authority or employ an HETAS Competent Person.

CHECK FOR BLOCKAGE AND GENERAL CONDITION

Where it is proposed to replace an existing appliance the chimney should be thoroughly checked for blockage and the internal and external condition checked for porosity or leakage. Any necessary repairs should be carried out before the new appliance is fitted.
If there is any doubt about the soundness of a chimney ie whether there might be substantial leakage through the chimney walls, either inwards or outwards, a smoke test should be carried out. A suggested method of doing this is given in BS6461 and later in this guide (see page 23).

CHECK-LIST

AID TO ASSESSING CONDITION OF CHIMNEY

Existing brick, or stone, pargetted chimneys built before the introduction of Building Regulations.

- Does the external appearance of the chimney seem to be in good condition? For example, no bad cracks in brickwork or rendering, badly disintegrated mortar joints or external staining.
- Does the chimney stack appear to be vertical and not leaning?
- Do brickwork joints need repointing particularly around the stack and does the mortar flaunching around the base of the terminal require renewal?
- Is the chimney pot in good condition and not restricted?
- Do the weather flashings between chimney stack and roof appear to be in sound condition?
- Does the chimney terminate in a position that might affect up-draught? For example well below the ridge of the roof, or over-shadowed by nearby trees or buildings.
- Is the chimney of sufficient height to ensure a reasonable up-draught? For example not less than 4.0 to 4.5m for an open fire or 2.4 to 3.0m for a closed appliance.
- Are there any openings, vents or grilles (inside or outside the house) in the chimney which might spoil the up-draught?
- Are there acute changes of direction in the flue where deposits might settle and not be effectively cleared by correct sweeping?

- Can the chimney be swept easily throughout its length, either through the appliance or through suitably positioned and accessible cleaning door(s) in the flue?
- Is there an accessible airtight flue cleaning door? If this is external is it of the double seal type?
- Has the chimney been swept recently? A chimney must be swept before connecting an appliance to it.
- Is there a cavity at the base of the flue which might interfere with the clearance of products of combustion?

SOME QUESTIONS THAT MIGHT BE ASKED WHERE AN APPLIANCE HAS ALREADY BEEN IN USE

- Have you ever noticed smoke or fumes coming into the room at any time?
- If so, has this been more or less continuous or intermittent, and only in certain weather conditions?
- Do you have any difficulty lighting the appliance or getting the fuel to burn up quickly.
- When was the chimney last swept?
- What kind of fuel have you been burning?
- Have you ever had a chimney fire?
- Have you noticed any signs of dampness or stains on the chimney wall outside or inside the house?

SUGGESTED METHOD FOR CHECKING THE SOUNDNESS OF A CHIMNEY BY SMOKE TEST

- The appliance should not be alight.
- Arrange for access into the roof space and to other parts of the house through which the chimney flue runs, and to the top of the chimney stack.
- Where a chimney stack is shared by two or more houses or flats, if possible make sure that no other appliances connected to the stack will be in use during the test.
  Note: If there is leakage through a mid-feather (withe), ie the wall between the flues, it may not be possible to detect this if another appliance is in use.
- Warm the flue using blow torch or fire lighters at the base for at least 10 minutes.
- Have available suitable means to temporarily seal off the top and bottom of the flue after it has been filled with smoke. (A plastic bag and sealing tape is useful for 'capping' the chimney pot).
- Light a smoke cartridge or pellets in the bottom of the flue.
- As soon as smoke issues from the chimney pot immediately seal off top and bottom of the flue, leaving the smoke cartridge to burn out and fill the flue with smoke.
- Observe all parts of the chimney for smoke leakage.
- Observe whether smoke issues from the top or bottom of any other flue in the same stack.
- Any smoke test should continue for at least 10 mins.

For details of remedial works see The Guide to Curing Chimney Problems 3.3. and the Guide to Lining Old Chimneys.

Air for combustion and ventilation

All solid fuel appliances require an adequate supply of air. The supply of air to the appliance has two functions. (Fig.35)

- Provide oxygen for combustion, a flame in a sealed container will extinguish as soon as all the oxygen available has been used up.
- Additional air is required to enable the products of combustion to be ventilated through the chimney flue to atmosphere.

COMBUSTION AIR

For the combustion of any fuel to take place oxygen is required. With the improved standards of construction and draught stripping the amount of advantageous air (air introduced around gaps around doors, windows, floor boards etc) (Fig 35) has dropped significantly. For this reason the Building Regulations Document J and Part F in Scotland gives guidance on the amount of fixed air vents needed.

Some solid fuel open fires, (underfloor draught types), proved air for combustion directly to the undergrate area of the fire from outside. This is air for combustion and amounts to only 10% of the total air requirements. The other 90% is required for ventilation.

VENTILATION

Ventilation air is required in addition to the air needed for combustion. This is the air used to replace that drawn into the chimney to transport the products of combustion to atmosphere. If there is insufficient ventilation air the products of combustion will travel more slowly up the flue and so deposit soot and condensation. If the lack of ventilation (air starvation) becomes acute “fuming back” may occur, this could lead to Carbon Monoxide poisoning.

Open fires and stoves which can be operated with their doors open will require far more air for ventilation than for combustion. In the case of the large period fireplaces or inglenooks the volume of air in a room can be replaced many times in just one hour.

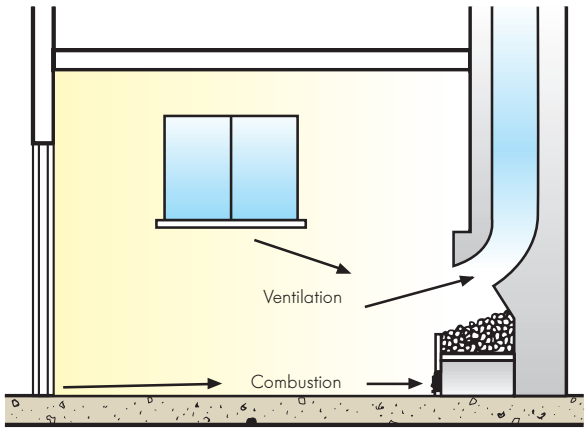
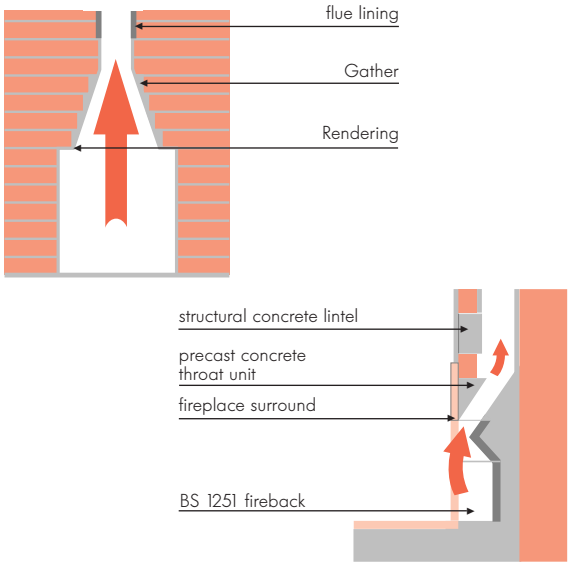


Fig 35

Inset open fire: section through gather



Section through throat Fig 36

Plan

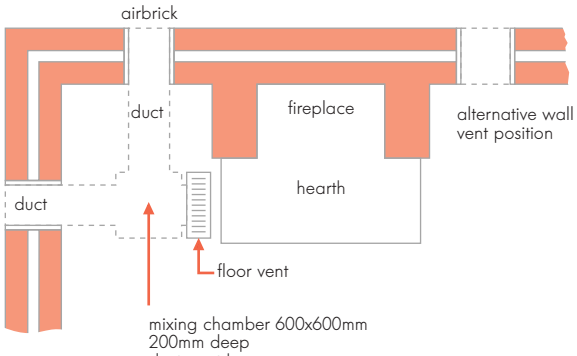
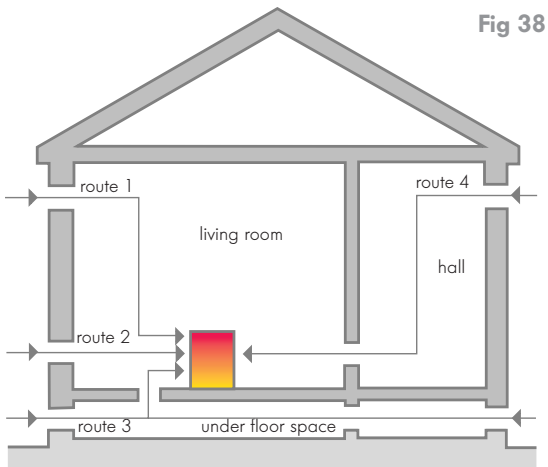


Fig 37

Fig 38



INSET OPEN FIRES

Good throat formation and gathering is essential for effective clearance of the products of combustion. Throat restriction increases the initial velocity of these into the flue and prevents smoke spillage into the room whilst, at the same time, reducing the amount of air flow through the room and therefore unnecessary heat loss to the flue.

Inset open fires need to be linked to the chimney by gathering from the top of the fire smoothly up to the flue.

The 'gather' may be achieved either by using a precast concrete throat and gather to channel the products of combustion from the fire into the flue, or by constructing this in situ in brick or block work. See Fig 36.

The throat should be 100mm from the front to the back and about 300mm wide. Many existing inset fires will be constructed as shown in Fig. 36 where a BS1251 throat forming lintel has been used in conjunction with the traditional corbelling out of the brickwork jambs to form the gather

PROVIDING VENTILATION

The required additional ventilation can be provided in many ways, direct from outside, through an outside wall or ventilated floor or via another room that is itself ventilated. Any vent installed must be permanently open and not capable of being closed.

When selecting an air vent it is important to ensure it has sufficient open area. Document J of the Building Regulations England & Wales gives the air requirements for solid fuel appliances and Part F for Scotland.

Terracotta air bricks do not give as large a free area as may be expected, a traditional 215mm x 140mm (9" x 6") air brick will only give around 4570mm^2 (7.5 square inches). An equivalently sized plastic air vent will provide up to 12900mm^2 (20 square inches). It is important to note that the fitting of a fly screen will greatly reduce the free area of a vent.

SITING OF VENTS

From the point of view of air supply it does not matter where the air vent is sited, but for an occupant in the room it can be very important. We recommend that when positioning an air vent the location should minimise cold draughts and ensure the vent is not unsightly.

Where a room has a suspended wooden floor which is well ventilated a good solution is to fit a simple floor vent to one or both sides of the hearth.(Fig.39c) For new construction using a solid ground floor the design should include two ducts from two walls at right angles to a mixing chamber below the floor and then from this to a grill in the floor. See Fig 37. and Fig. 38 (Route 3).

Telescopic Wall Vent

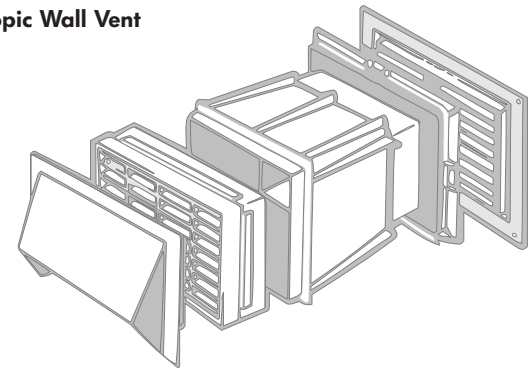


Fig 39a

Draught Master Vent

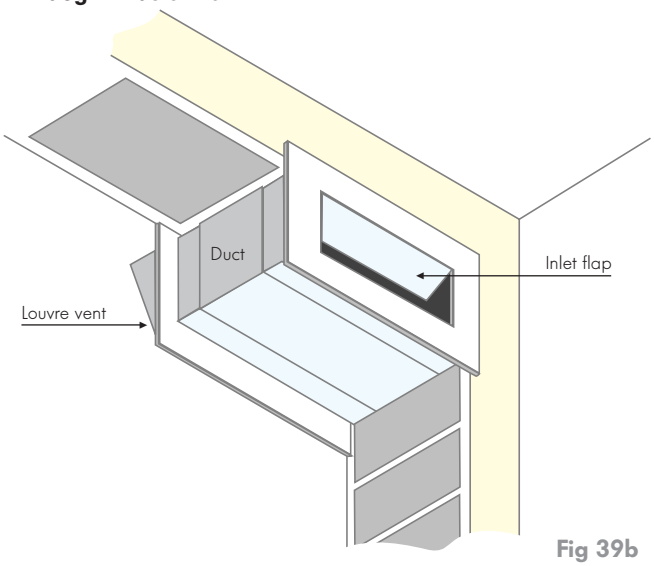


Fig 39b

Floor Vent

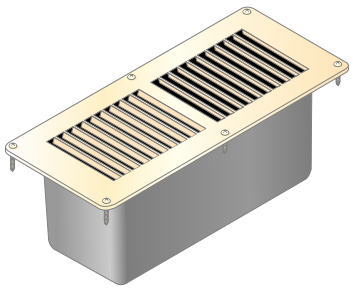


Fig 39c

Rooms with existing solid floors present a more difficult problem. Venting directly to the outside, (Fig 39a) preferably at high level to minimise cold draughts, is a simple answer. See Fig. 38 - routes 1 or 2. However be warned, a vent on the windward side of the house may introduce excessive amounts of cold air.

Alternatively, a vent on the lee side (low pressure side) of house may actually suck air out of the room! This would tend to pull smoke and fumes back into the room, defeating the reason for the vent in the first place. Fig. 30.

Try to chose a wall in a neutral position in relation to the normally prevailing wind direction.

A better solution in this situation can be to vent from another room, conservatory or hallway and then to vent this room from outside. See Fig. 38 - route 4. Such vents must have at least the same free open area as that laid down for the fire being served. If more than two vents are in series, then the subsequent ones must be increased by 50%. Vents between rooms should be no higher than 450mm (1'6") from floor level, to reduce the spread of smoke in the event of a house fire (see BS5440 pt. 2-4.1.2.1). The Draught Master vent (Fig. 39b) has a self closing flap that prevents a backward flow of gases and so can be fitted at higher level.

EXTRACTOR FANS

Where extractor fans are fitted into a property then additional ventilation will be required in the same room. This will avoid the extractor fan creating a negative pressure in the property that may interfere with the operation of a chimney.

Extractor fans must not be sited in the same room as a solid fuel appliance.

Hearth and Appliance Recess

The main features of the hearth and appliance recess are introduced here. For explanatory purposes the requirements and dimensions described are based on the Building Regulations Approved Document for England and Wales.

Solid fuel appliances for domestic use and not exceeding 45kW output come within Section J of the Building Regulations for England & Wales and Part F for Scotland.

The constructional hearth is the fireproof base for the fireplace and chimney. It should be solid and non-combustible and when set in a recess it must fill the recess and extend:

- 150mm each side of the builder's opening
- 500mm in front of the opening
- Be a minimum of 125mm thick. See Fig. 40

A central or abutting hearth must be large enough to include a square of not less than 840mm sides.

Dimensions of constructional hearths for class1 appliances

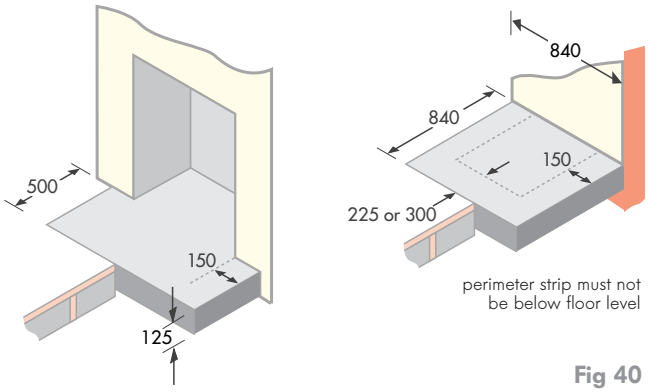


Fig 40

Constructional hearths can be suspended at ground floor level as shown in Fig. 41 or at upper floors.

The constructional hearth may have a decorative finish or a separate decorative slab can be added. Such a slab is often referred to as a superimposed hearth.

If a separate slab is used it should be to BS1251, a minimum of 48mm thick and extend forward from an open fire by 300mm or 225mm for a closed appliance.

The superimposed hearth sometimes incorporates a raised edge or kerb which is sloped for easy cleaning. The appliance recess above the hearth which houses the fire or appliance should be constructed from solid non-combustible material 200mm thick at the back and sides.

The raft lintel supports the chimney breast and acts as a starting plate for the flue liners in new houses or when lining an existing chimney.

Constructional hearth suspended floor

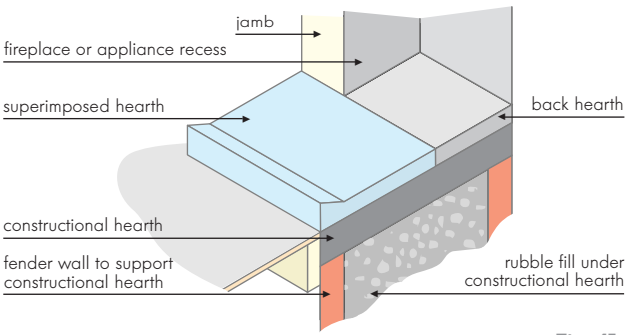


Fig 41

Hearth and appliance recess

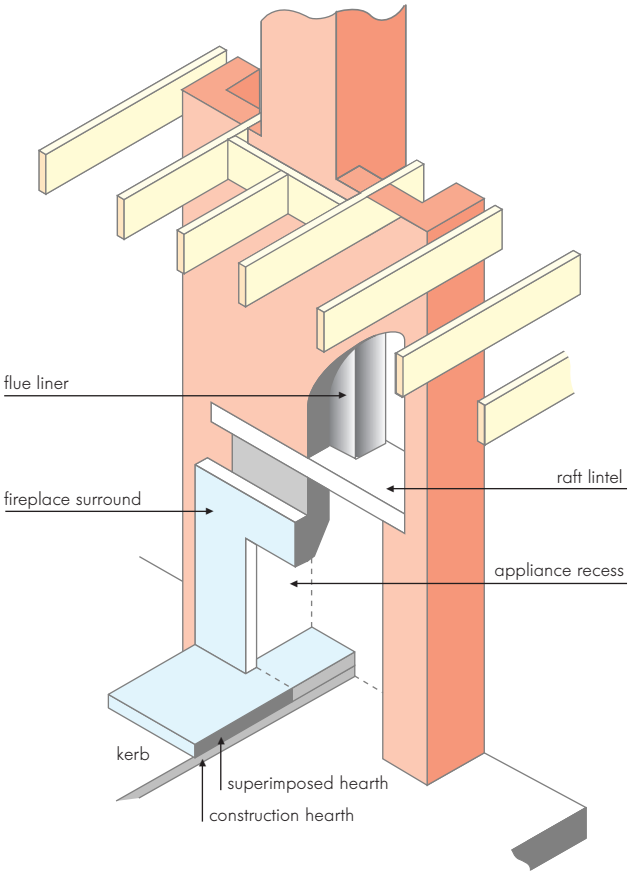


Fig 42

Appliance recess roomheater application

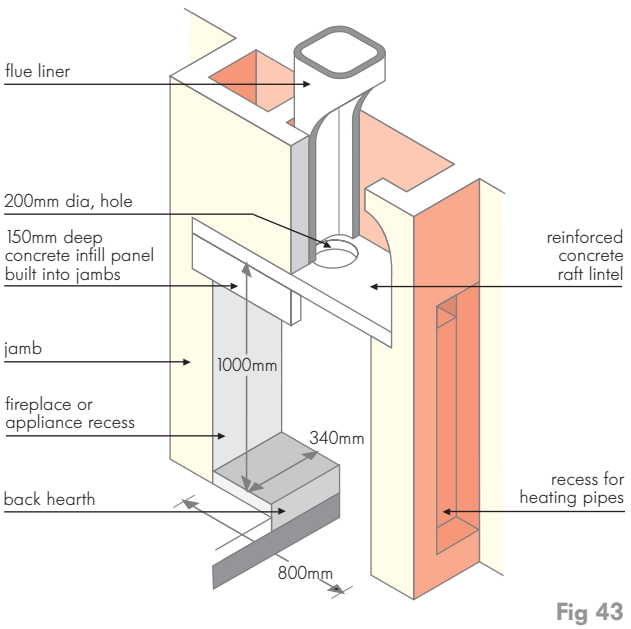


Fig 43

Fireplace surrounds are normally manufactured off site, and often in the form of a single slab with fixing clips at the side for screwing into the chimney breast. The surround is usually supplied with an associated superimposed hearth or slab suitable for laying directly on the constructional hearth on a thin bed of weak mortar. See Fig. 42.

Different forms of construction are leading to a greater variety of types of surround and hearth.

Fireplaces can be built on site using bricks, blocks or slabs of natural or compound materials. Materials used include ceramic tiles (glazed or unglazed), slate, reconstituted stone, marble, iron, stainless steel, copper and brass.

Appliance Recess

The traditional appliance recess is a rectangular opening 575mm wide, varying in height up to 625mm and sometimes larger. Current developments favour a recess capable of accepting a wider range of appliances than envisaged for the traditional recess. Such a larger opening will also allow for future appliance development and for the interchange of different types of appliances without having to make extensive alterations to the structure.

Fig. 43 shows the recommended dimensions for the recess.

When a roomheater is to be used with a typical fireplace surround, the height of the recess is reduced at the front by inserting a 1000mm long x 30mm wide x 150mm deep concrete blanking panel which is built into the jambs.

Appliance recess open fire application

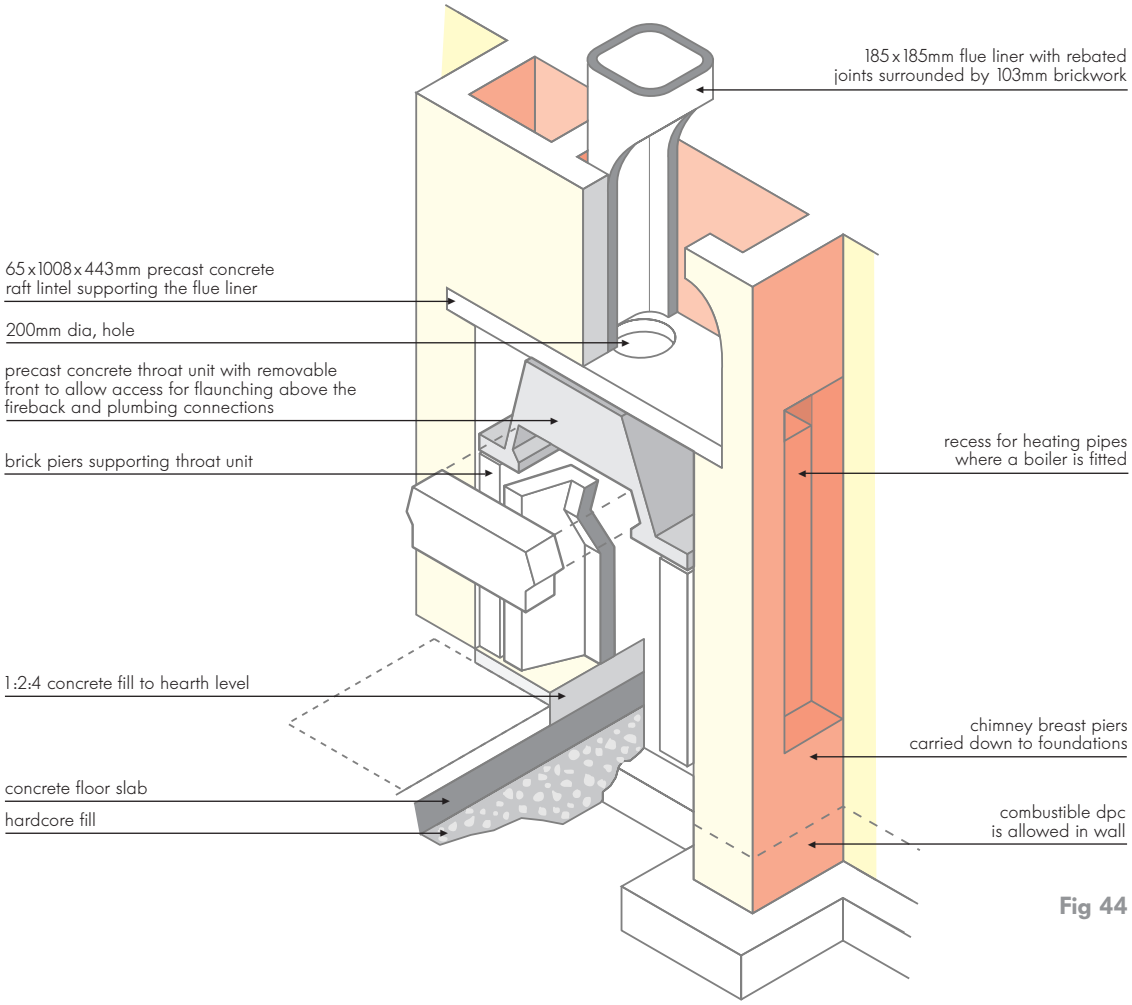


Fig 44

When an inset open fire is to be used the recess dimensions can be reduced by the introduction of two half-brick piers to support the precast concrete throat (Fig 44) unit which provides the necessary gather to the flue.

The 1000mm clear opening height should be regarded as a minimum. In practice, assuming that the raft lintel is coursed into brickwork, then different floor constructions, screed thicknesses and designs of superimposed hearth can result in the opening being up to 1065mm high.

Appliance recess open fire application

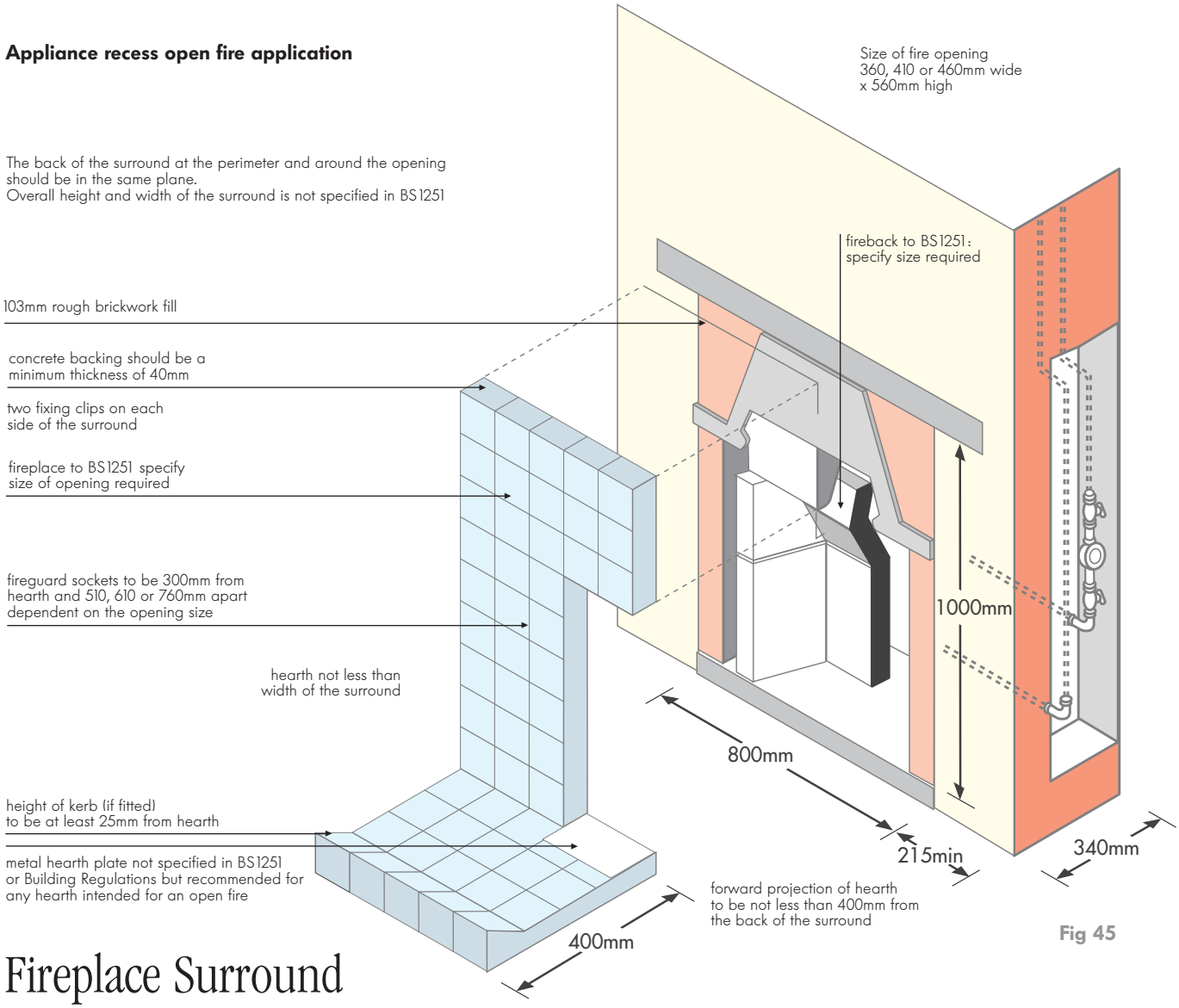


Fig 45

Fireplace Surround

The fireplace surround and hearth illustrated above (Fig.45) is the type produced by the slabbing process and which forms the basis of the BS1251 specification. This type constitutes the major type of British fireplace in production at present.

Some alternative approaches to the design of the fireplace surround and hearth have been illustrated in Figures 46 and 47.

The concrete mix is usually based on aluminous cement although Portland cement is permissible within British Standard Specification 1251 and is used occasionally. The concrete comprises cement and aggregate which may be either those commonly used in normal concrete or a lightweight material such as pumice or expanded perlite. Although it is slightly more expensive the use of the lightweight concrete can reduce the overall weight of a surround by as much as 40 per cent which facilitates handling in stock and on site, particularly when installation is above ground floor level.

Notice Plates for Hearths & Flues

In accordance with Building Regulations

Where a hearth, fireplace, flue or chimney is provided or altered in any way, a notice plate must be fixed within the building. This plate must show the following information.

1. Location of hearth and fireplace and flue.
2. Type of flue and size including manufacturers name.
3. Category of flue and generic name of appliance suitable.
4. Installation date.

See Building Regulation's Part J for England & Wales and Part F for Scotland for more details.

BASIC PROPERTIES

SURROUND

Except for the perimeter of the surround where timber may be used as a frame, mantel or shelf the materials of the face of the surround should have the following basic properties:

- Non-combustible.
- Resistant to heat up to a temperature of 350°C.
- A surface texture which is sufficiently impervious to enable deposits of smoke and grime to be easily removed by normal domestic cleaning methods without affecting the colour or texture.

HEARTH

Materials used for the facing of the hearth should possess the same basic properties as those used for the surround and, in addition, they should have sufficient resistance to abrasion and impact to avoid deterioration or damage from the movement of fireparts, ash pans, fire accessories, etc., or the spillage of ashes or fuel.

MATERIALS SELECTION

The wide range of materials used for fireplace surrounds include: ceramic tiles (glazed or unglazed), slate, stone (natural and reconstituted), marble, brick and metals (iron, stainless steel, copper and brass).

Throughout this range of materials there is a variety of colours, and surface textures and careful selection is necessary. For example, some bricks and stones have dense, hard surfaces which make them very durable in arduous conditions whereas others have soft, porous textures which render them difficult to clean and subject to impact damage. Depth of colour also plays a part in obscuring discolouration. Polished marble is a relatively expensive material sensitive to surface scratching and attack from liquids of a mild acidic nature, such as fruit juice.

Fig 46

Fig 47

Siting the Fireplace

LIVING AREAS

It is worth checking that the arrangement of the doors, windows and the fireplace will accommodate typical furniture layouts.

Most layouts for rectangular rooms will have the TV set alongside the fireplace as it is difficult to arrange two 'focal' points.

Fig. 48a shows a typical arrangement for the fireplace in a semi detached house centrally placed along the party wall.

Fig. 48b show another typical arrangement with the fireplace in the centre of the wall below the ridgeline of the house.

*Note that the door and window openings are sited away from the fireplace.

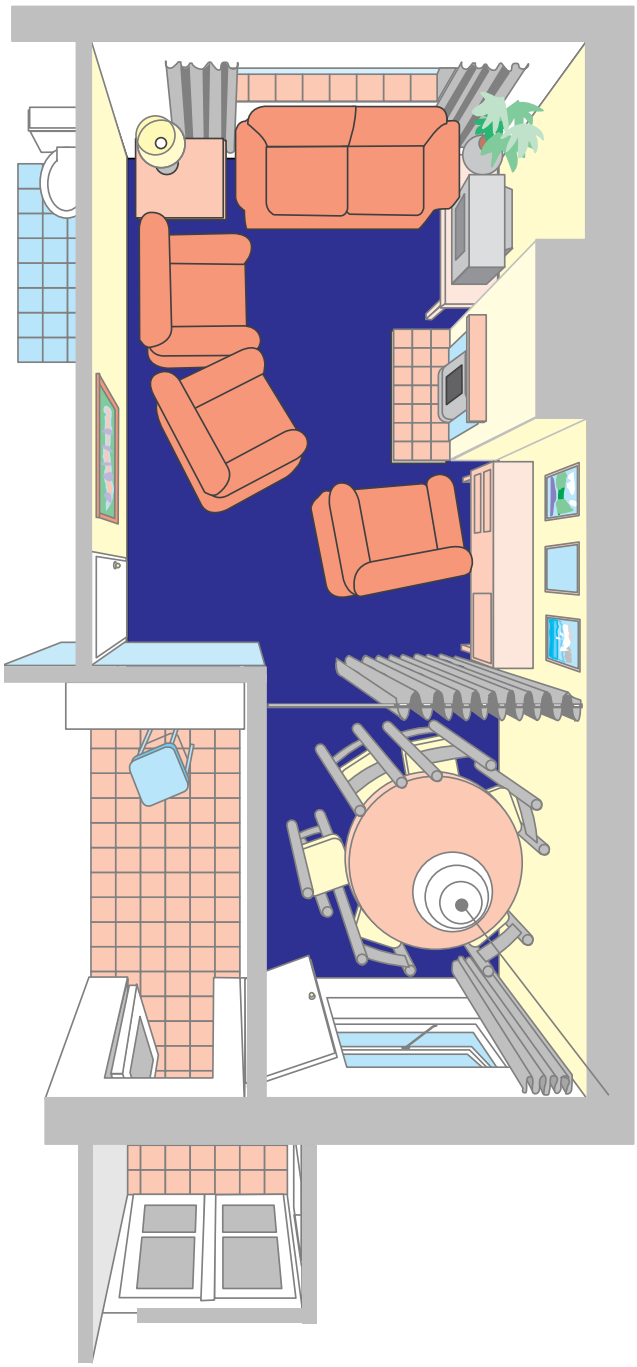
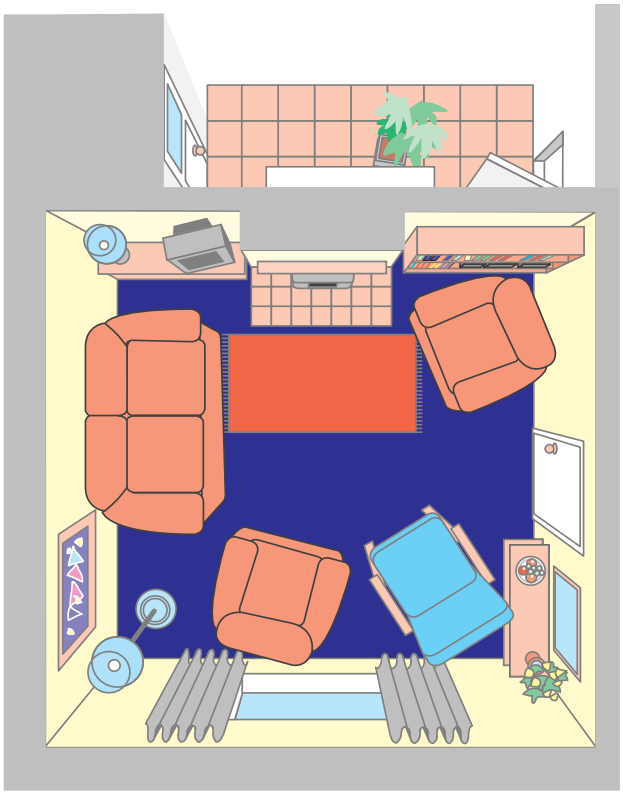


Fig 48a

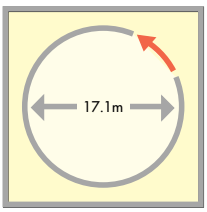
Fig 48b



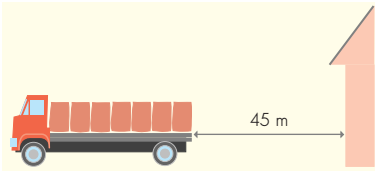
Fuel Store Design

DESIGN REQUIREMENTS

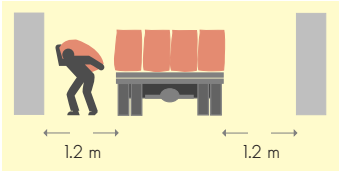
DELIVERY ACCESS



Delivery vehicles are usually similar in size and manoeuvring requirements to refuse collection vehicles. A coal delivery vehicle for domestic supplies is typically five tonne non-tipping, requiring an 8.1m turning radius with a 0.45m clearance, i.e. a 17.1m turning circle.



Max carry distance



At the unloading point a clearance of 1.2m on each side of the lory is desirable

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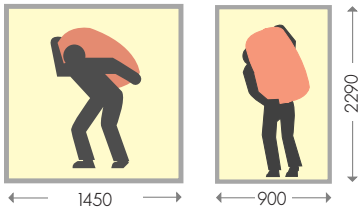
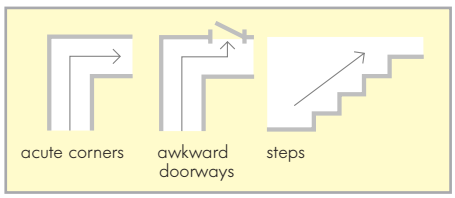


Any access way or passage between lorry and storage should have a minimum clear height of 2290mm (unobstructed by light fittings) and a minimum width of 900mm.
The width of passage should be increased to 1450mm opposite the opening into fuel store.

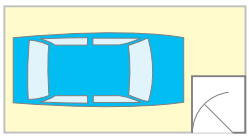


AVOID ON THE DELIVERY ROUTE

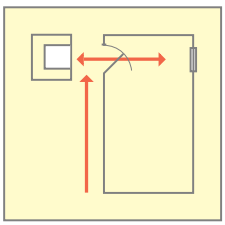
The location of the fuel store must be in a position easily accessible to the coalman.

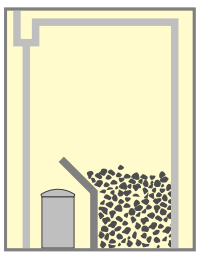
FUEL STORAGE. Consider location alternatives.

In association with the garage.

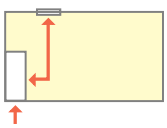


As part of the external storage.

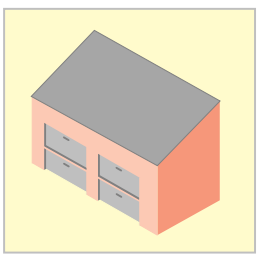




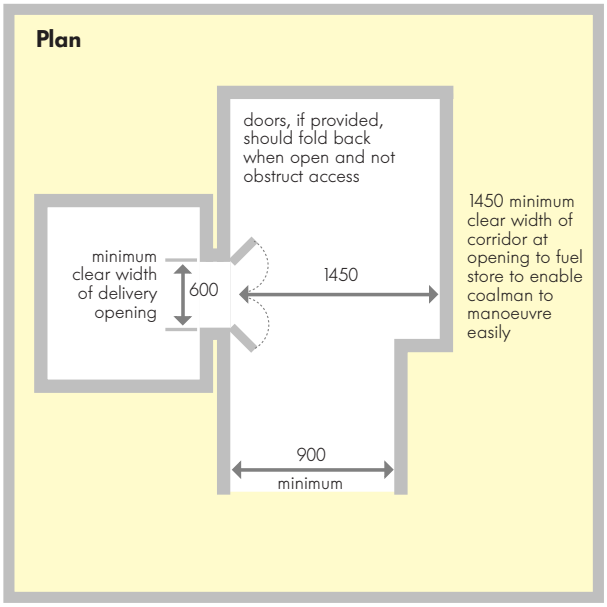
In association with the refuse store with delivery access through a hatch over the dustbin recess.

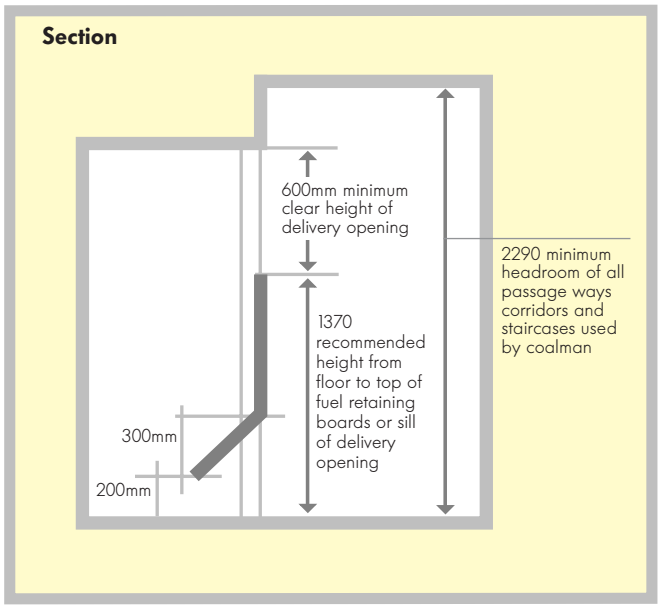


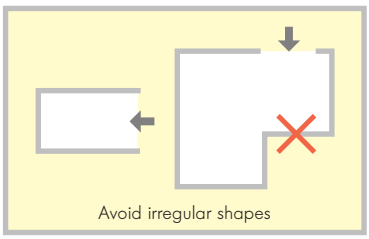
As an internal fuel store with external delivery.

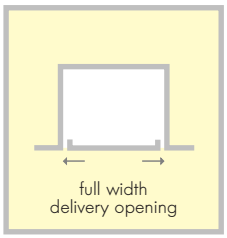


As separate external store.



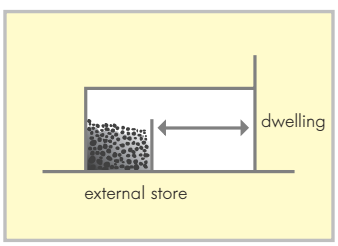






Boiler Output rating (kW)	Capacity Tonne	Type of fuel	
		Dense m^2 (floor area)	Coke m^2 (floor area)
upto 15	1	1	1.5
15-20	1.5	1.5	2.25
25-35	2	2	3
35-45	3	3	4.5

NOTE The figures given in the table assume a stacking height of 1.4m above floor level, a specific volume of dense fuel of 1.4m^3/tonne and a specific volume of coke type fuel of 2.2m^3/tonne.



DIMENSIONAL REQUIREMENTS

Delivery opening should be so positioned on plan that the full capacity of the store can be utilised with the minimum trimming of coal by the delivery man. (An irregularly shaped store with an opening at one corner is liable to lead to an over optimistic estimate of storage capacity.)

The delivery opening should preferably extend for the full width of the fuel store.

Chutes and hoppers are not recommended. (In practice the mouth of the sack cannot be fully inserted and is likely to be spilled.

STORAGE CAPACITY

As large as possible to take advantage of bulk purchase summer offers.

Recommended storage minimum is 2.7m^3 for carbonised smokeless fuels (i.e. coke) and 1.27m^3 for other smokeless fuels and coal (i.e. dense)

USER ACCESS

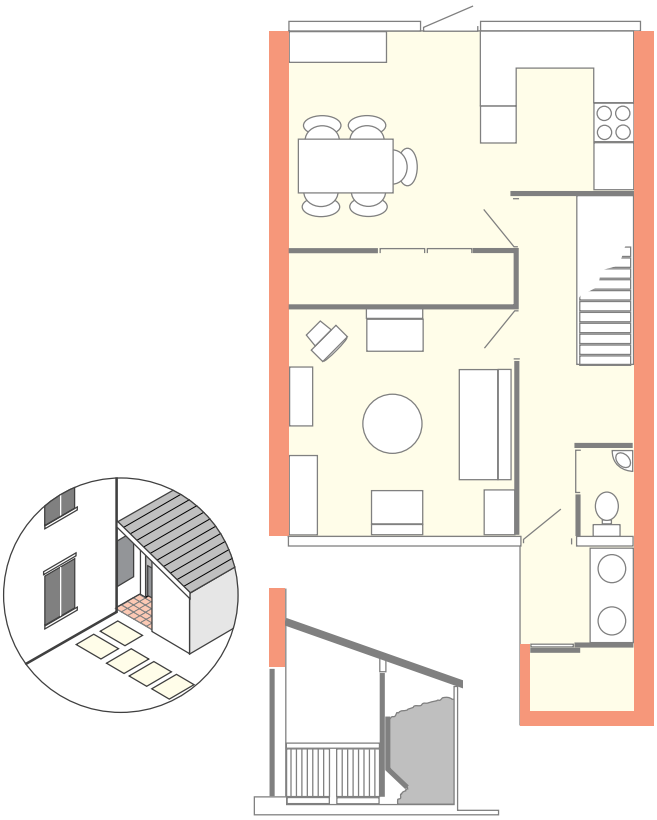
Access to fuel store should preferably be under cover. Minimum travel distance is desirable between storage access and the fire or boiler.

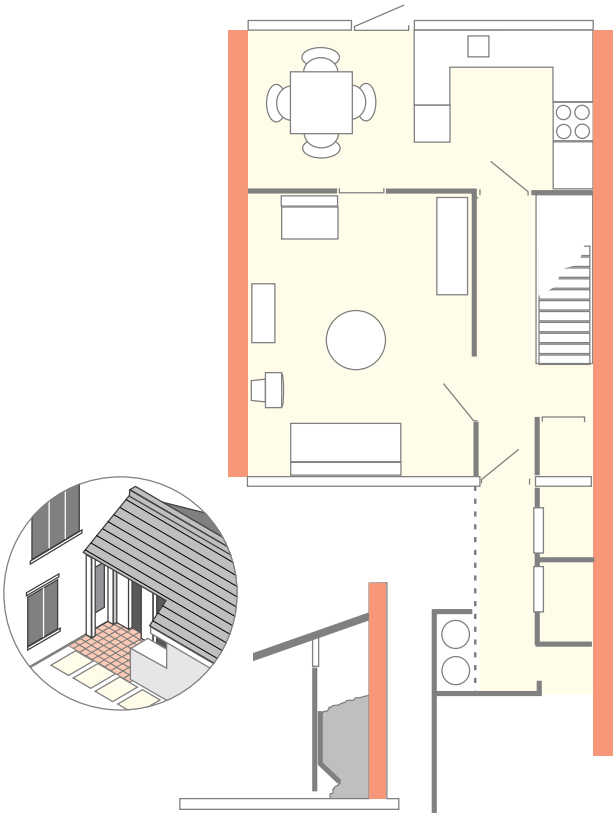
An internal fuel store must be secure against external entry of animals or housebreakers via the delivery access.

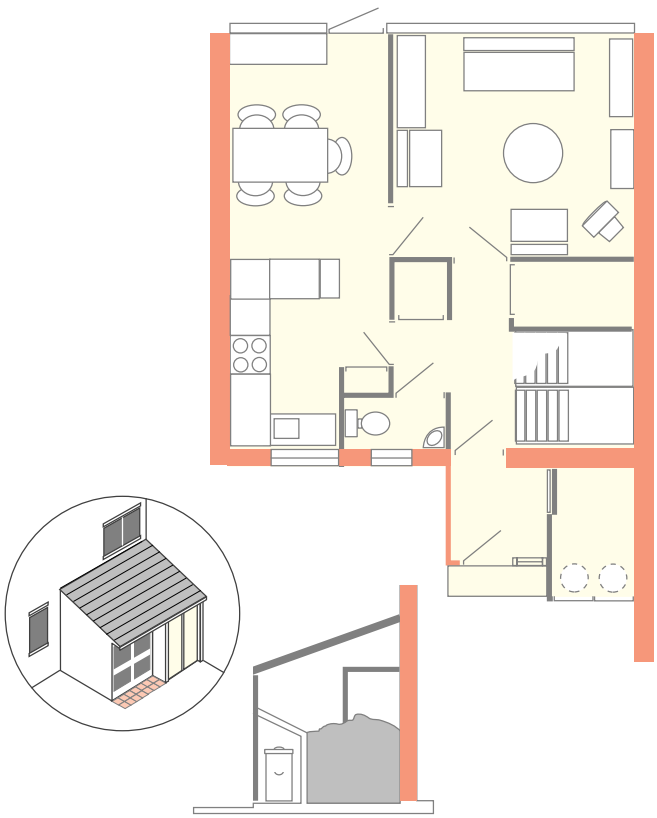
ASH DISPOSAL

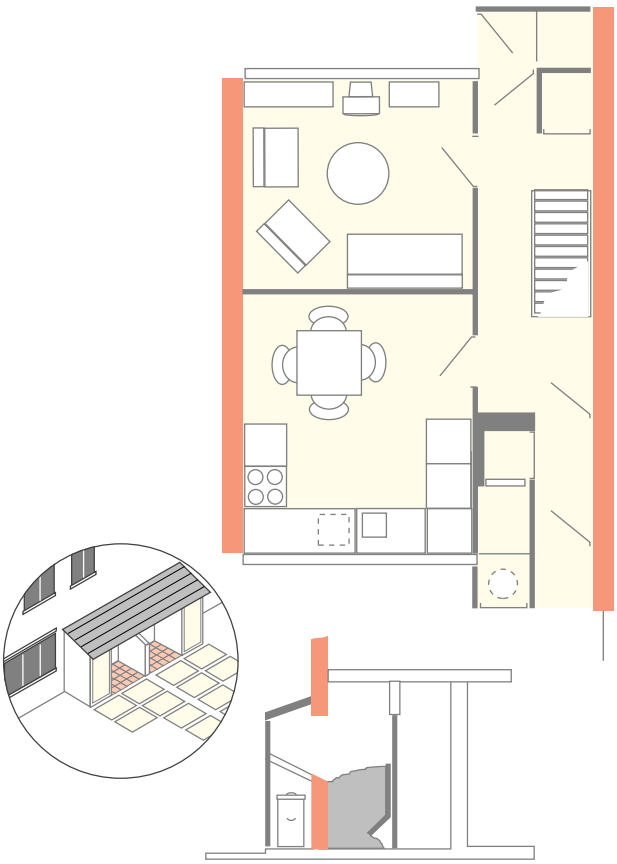
Special portable bins are available for the disposal of ash. They are particularly useful for the temporary storage and cooling of hot ash prior to disposal in plastic bins or sacks.

Some Fuel Storage Arrangements for Terrace Housing









COMPLETE SOLID FUEL GUIDE LIST

2.1 The Guide to Designing Solid Fuel into Homes.

2.5 The Guide to Solid Fuel "Link Up".

3.2 The Guide to Period Fireplaces.

3.3 The Guide to Curing Chimney Problems.

3.4 The HETAS Approval Guide.

The Guide to L1. Conservation of Fuel & Power.

The Guide to Lining old Chimneys.

The Guide to Solid Fuels.

The Guide to Opening up your Fireplace.

The Solid Fuel Safety Guide.

The above is a list of Solid Fuel Guides available or currently in production.

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