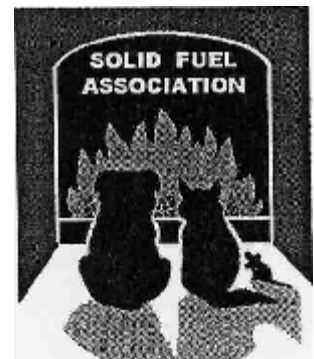
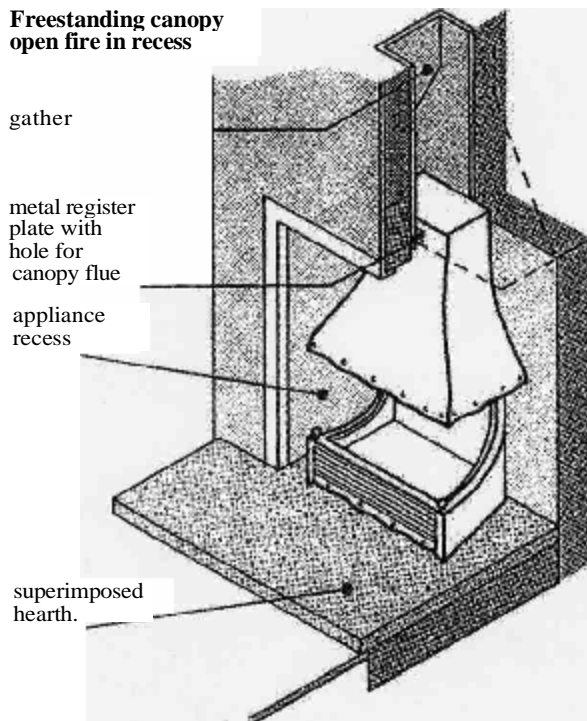


PERIOD FIREPLACES



PERIOD FIREPLACES

For hundreds of years dwellings were heated by some form of open fire. In more recent years central heating has become popular due to the demand for a higher standard of heating. The limitations of the open fire for this purpose resulted in a loss of favour for quite some time, but it now appears the comforting glow of a real fire is rapidly gaining popularity and becoming an integral part of the home in addition to any central heating system.

In the majority of cases the standard open fire in the lounge or living room is sufficient to give this additional comfort. In large houses with more spacious rooms there is a demand for open fires in a period setting.

The usual requirement is a large fireplace recess containing a dog-grate and incorporating an elegant surround of modern brickwork or one of the varieties of decorative stone.

Architects and builders have the skill to design and build magnificent examples of this type of open fire, but in some cases trouble is experienced with smoke emission into the room. This occurrence causes the specifier a great amount of worry if the cause is not obvious. Expensive experimentation is often carried out endeavouring to find a solution.

There are a number of reasons for smoke emission from open fires, such as:-

1. Cross sectional area of flue too small
2. Chimney too short
3. Chimney leaks
4. Chimney very exposed
5. Chimney flue excessively large
6. The adverse effect of the wind
7. Air starvation
8. Chimney throat too large
9. Large cavity above the throat

This paper deals essentially with the actual sizing of the chimney. It is often assumed that providing there is a clear shaft to the outside there should be no reason why the combustion gasses cannot be successfully vented to atmosphere. This would be a reasonable assumption where there is a standard fireplace opening and chimney but any variation from standard may lead to smoke emission.

There is a relationship between the area of the fireplace opening and the cross sectional area of the flue. It is recommended the internal dimension should be 225mm (9") in diameter and 200mm (8") as an absolute minimum, for liners in a chimney from a fireplace. Therefore, assuming a 560mm x 400 mm (22"x16") standard fireplace opening was installed, the ratio between the area of the fire opening and cross section area of the flue would be approximately 7 or 9 : 1. In general therefore, and to give a margin of flexibility, it is suggested the ratio should be no more than 6 : 1 in order to induce the products of combustion (and the air from the room) to flow through the throat at a sufficient velocity to prevent emission into the room. For high chimneys, say 8 - 10 metres or more the ratio could be increased to say 8 : 1 or 9 : 1 .

The throat must be correctly formed and have an area not larger than the cross sectional area of the flue. The gasket should be filled in and streamlined into the flue.

Where feature fires are required, with fire openings larger than standard, the flue area must be increased proportionately.

The following are examples of the various designs and the necessary calculations:-

- 1 Assuming a fireplace opening is required 900mm wide and 760mm high to accommodate a dog grate. The required flue area based on the 6 : 1 ratio would be:-

Area of fire opening - $900 \times 760 = 684000$ sq mm

Required flue - area $684000 \div 6 = 114000$ sq mm

The nearest circular liner would be 380 mm diameter.

2. Where there is an existing chimney with a 225 x 225mm flue and the largest possible fire opening is required, the first step is to check the actual dimensions of the flue. If the internal surfaces are parged it may measure only 200 x 200mm, therefore these figures must be used in the calculations.

Flue area - $200 \times 200 = 40000$ sq mm

Maximum fire opening - $40000 \times 6 = 240000$ sq mm

It must be stressed this ratio can only be used where the condition of the chimney and the size and formation of the throat are entirely satisfactory. Otherwise a lower ratio must be used, therefore it is advisable to check the condition of existing chimneys. A coring ball lowered down the flue will ensure clearance and a smoke test should reveal any leakage.

It is possible to have a larger fireplace opening with a flue of this size providing a suitable appliance is installed. For example the Rayburn Rembrandt freestanding canopy fire. However it is essential the appliance is installed in accordance with the manufacturers installation instructions, so these should be studied before chimney construction is started.

3. Where a fireplace is designed with two fire openings such as one each side of the chimney breast, the total area of *both* fire openings must be added together to determine the required flue size. This design of fireplace cannot be used to serve two separate rooms, there must be a permanent open access between the two rooms.
4. Another popular design is a large fireplace recess containing a dog-grate with a canopy above connected to the flue. In this case the dimensions of the perimeter of the canopy are used to calculate the required flue area and not the width and height of the fireplace opening. In this installation the top of the fireplace recess must be closed off with a sheet of metal (this is called a register plate). The edges of the register plate must be sealed in the brickwork joints to make it airtight. Before fixing a hole must be cut out of the register plate to allow the constricted end of the canopy to pass through to the flue. It should extend up through the chimney gather to the point where the flue actually commences and sealed again at this point if possible. A good seal must be made between the canopy and the register plate. It is essential the area of the outlet end of the canopy does not exceed the area of the flue. It should be as near the same as possible. A butterfly damper can be fitted into the canopy just below the level of the register plate to serve the same purpose as an adjustable throat restrictor.

Where possible the canopy should be designed with a vertical back section to fit flush to the back wall of the fireplace recess, and with some reinforcement a good fixing can be achieved.

Assuming a canopy is designed and fixed as described and its dimensions are say, 600mm x 400mm and from the hearth level to the bottom of the canopy 500mm, the open area would be $600 + 400 + 400$ (perimeter of canopy) x 500mm = 700000 sq mm. Using the 6:1 ratio the cross section flue area would have to be 116666 sq mm.

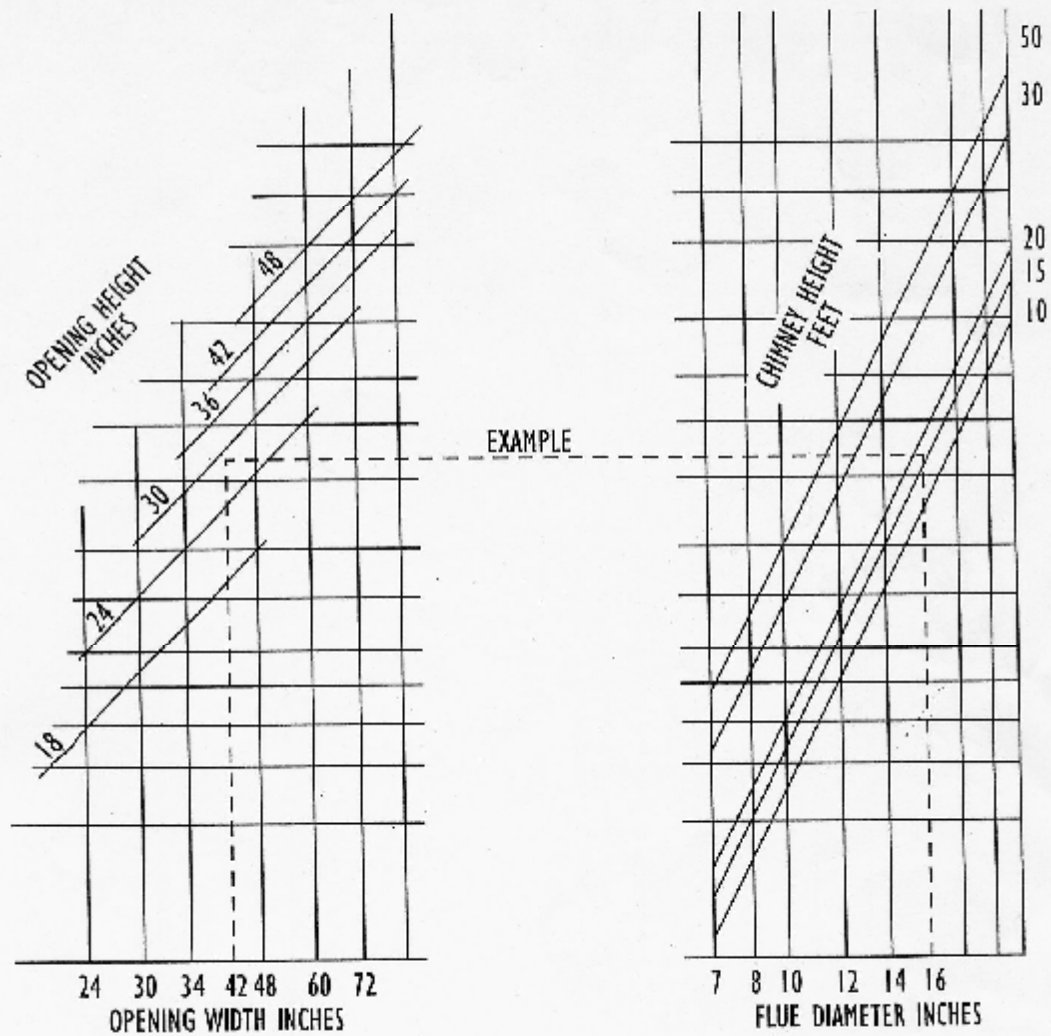
5. The final example is a fireplace in the centre of a room, open on all sides incorporating a square or round canopy. In this case the measurement of the complete perimeter of the canopy and its height above hearth level are used to determine the required flue area. For this exercise, assume the perimeter of the canopy is 2500mm and fixed 600mm above hearth level, the total open area will be 1500000 sq mm, therefore using the 6:1 ratio the required flue area would be 250000 sq mm.

It is impossible to lay down hard and fast rules for the design of this type of fireplace due to possible variable factors, therefore it must be accepted the purpose of this paper is to provide some general principles to guide the designers. In the main, following these guidelines and assuming the flue and its terminal are satisfactory, an open fire setting of this kind should function well. It must be noted of course that all chimney lining must comply with Approved Document J of the Building Regulations 2010.



Solid Fuel Association
95 High Street, Clay Cross, Chesterfield,
Derbyshire S45 9DZ
Tel: 01773 835400

APPROXIMATE CHIMNEY SIZING CHART FOR FIREPLACES



Notes:

Example: Chimney height 20', Fireplace 42" wide x 30" high.
(When interpolating flue diameter readings take next larger size.)

Chart based on a mean velocity of 45' per minute at face of fireplace.

Chimney height measured from entry into flue.