

Sizing fireplace openings and flues

Size the fireplace to fit the room, then size the flue to assure enough draft

By Kenneth A. Hooker

To look good and function properly, a fireplace needs pleasing proportions and an appropriate relation of fireplace area, flue size, and chimney height. Though designs vary, many common patterns have emerged through experience with successful fireplaces. Straying too far from accepted practices may result in a fireplace that burns poorly or fails to conform to building codes.

Sizing the opening

Determining the size for a fireplace opening is mainly an aesthetic decision that depends on the size of the room and the visual prominence the fireplace is to have. Another factor is the size of fire that's appropriate for the room and its intended uses.

A fireplace that's too big may overwhelm a small room and produce a fire that makes the room uncomfortably warm. One that's too small may lack visual impact and produce too little heat to be enjoyed. One guide suggests a fireplace opening that ranges from $\frac{1}{60}$ to $\frac{1}{65}$ of the room area. The $\frac{1}{60}$ ratio applies to small rooms; the $\frac{1}{65}$ ratio to large rooms (Ref. 1).

A fireplace opening's height-to-width ratio should be between 1:1 and 1:2. Not only is a wider opening more pleasing aesthetically, but a tall, narrow opening is more likely to release smoke into the room.

As to depth of the firebox, the *Uniform Building Code (UBC)* and *BOCA Basic Building Code* require standard fireplaces to be at least 20 inches deep. Since it's unclear in the standard codes whether this depth includes the facing material

or only the firebrick burning area, it's safer to assume the latter.

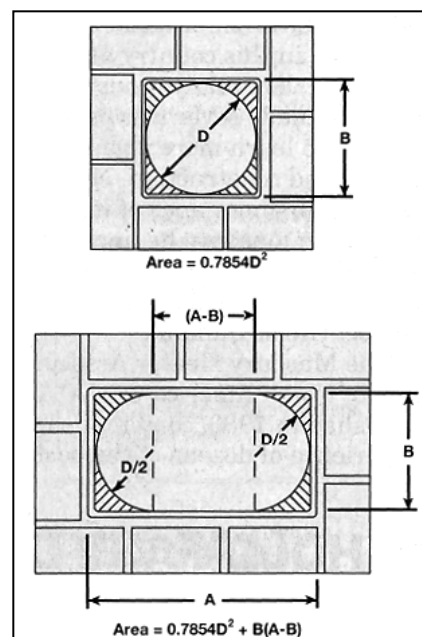
Multipenning fireplaces

Some fireplaces have more than one open face. Corner or L-shaped units have two adjacent faces. Other designs include the look-through type with two opposite faces and three-face types. Designs for multipenning fireplaces should be considered carefully to prevent draft problems. Besides flue size, consider the type and size of damper needed and the location of walls and doors. Avoid locations where cross drafts might blow smoke and sparks from the fireplace into the room.

Building codes set minimum flue size

Once the size of the fireplace opening is set, you can determine the appropriate flue size. A flue that's too small will have insufficient draft. A flue that's too large may cause the fire to burn more vigorously than necessary. Even though this tendency can be regulated by adjusting the damper, using an oversized flue wastes space and materials. For a given fireplace opening and flue size, increasing the chimney height increases the amount of draft.

Building codes typically require a minimum flue size, expressed in terms of cross-sectional area, in relation to the area of the fireplace opening. The most common case is $\frac{1}{60}$ of the fireplace opening area, but with a minimum size specified. The UBC allows round flue liners to be only $\frac{1}{2}$ the area (minimum 50 square inches) but requires $\frac{1}{60}$ the area (minimum 64



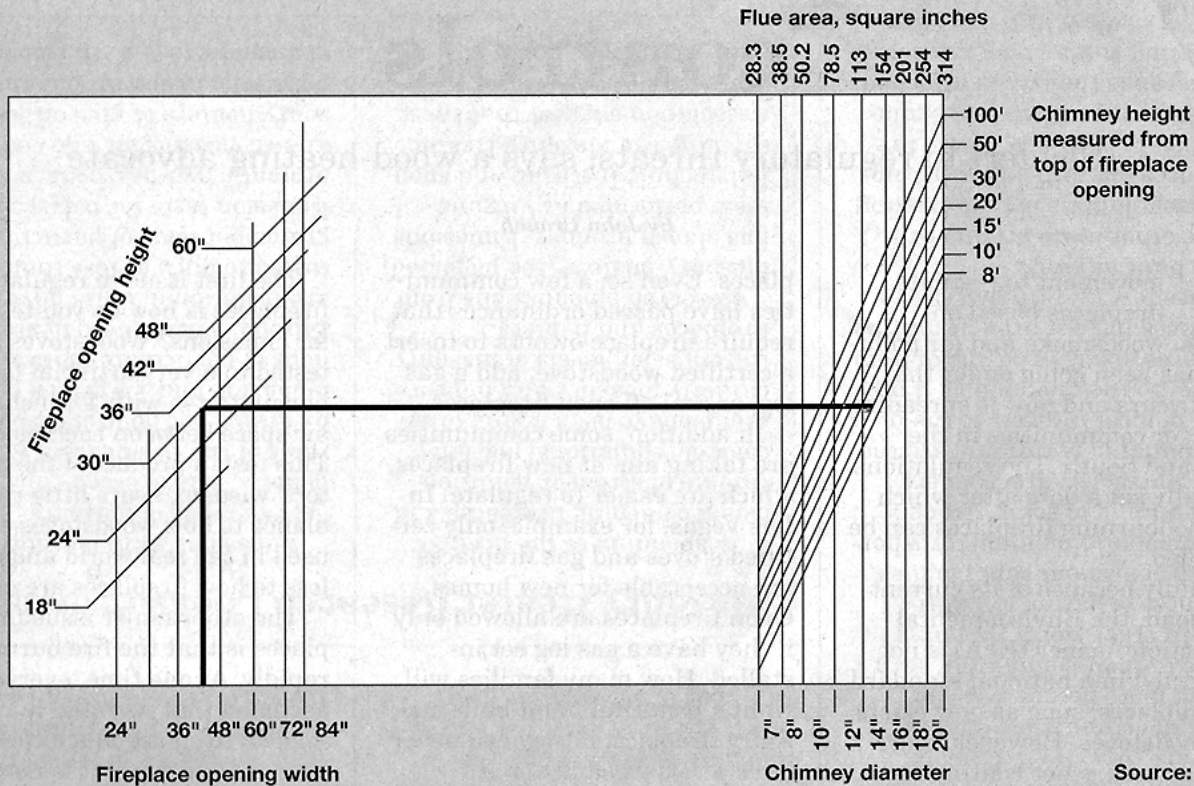
The effective flue area (EFA) of square or rectangular flues omits the area of the corners. Calculate the EFA of a circular or oval flue of equal inside dimensions.

square inches) for square or rectangular liners. The Federal Housing Administration (FHA) requires flue liners $\frac{1}{60}$ the area of the fireplace opening if the chimney is less than 15 feet tall, $\frac{1}{60}$ for chimneys 15 feet and taller.

Effective flue area

The types of flue liners available vary somewhat by locality. Round or oval liners are common in seismic areas, because they facilitate placement of reinforcing steel at the chimney corners. Draft is more efficient in a round or oval flue than in other shapes of equal cross-sectional area, because exhaust gases tend to spiral upward. Round or oval flues also may require less maintenance, be-

Fireplace Sizing for Circular Chimneys



Source: Ref.2

cause soot and creosote collect more readily in the corners of rectangular flues.

In fact, the American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE) (the source of the chart) recommends using round or oval liners whenever possible. When you use square or rectangular liners, you must calculate the effective flue area (EFA) using the inside dimensions of the liner minus any corners.

For example, 10-inch-square flue has an effective flue area equal to the area of a circle 10 inches in diameter.

$$\text{Area} = \frac{\pi D^2}{4} = 0.7854 \times D^2 =$$

$$0.7854 \times 10^2 =$$

78.54 square inches

The EFA of a rectangular flue is the same as that of an oval flue of equal length and width. Calculate the area of the half circles inscribed tangent to each end, plus

the area of the rectangle between them. For a 10x14-inch rectangular flue, the EFA would be the area of the circle, $0.7854 \times 10^2 = 78.54$ square inches, *plus* the area of a 10x4-inch rectangle, $10 \times 4 = 40$ square inches, a total of 118.54 square inches.

Using the chart

The chart provides a simple means of calculating the proper flue size for a particular fireplace opening. Find the height of the opening at the left of the chart and the width of the opening at the lower left of the chart. For multiopening fireplaces, figure the width as the largest area through which air will be drawn:

- For an L-shaped fireplace with two adjacent openings, use the diagonal distance between corners.
- For a look-through fireplace with two opposite faces open, add the widths of both openings.
- For a fireplace with one short and two long openings, add the widths of both long sides.

- For a fireplace with one long and two short sides, add the widths of one short side and the long side. Follow the lines from each dimension until they intersect. Draw a line horizontally from their intersection to the right until it meets the diagonal line that corresponds most closely to the height of the chimney. The vertical bar inside which the horizontal (opening area) line meets the diagonal (chimney height) line represents the flue area needed to assure proper draft. **A**

References

1. James E. Amrhein, *Residential Masonry Fireplace and Chimney Handbook*, 1989 Masonry Institute of America, 2550 Beverly Blvd., Los Angeles, CA 90057.
2. *ASHRAE Equipment Handbook*, 1988 American Society of Heating, Refrigerating, and Air-conditioning Engineers, 1791 Tullie Circle NE, Atlanta, GA 30329.

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