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FIREPLACE AND CHIMNEY DETAILS

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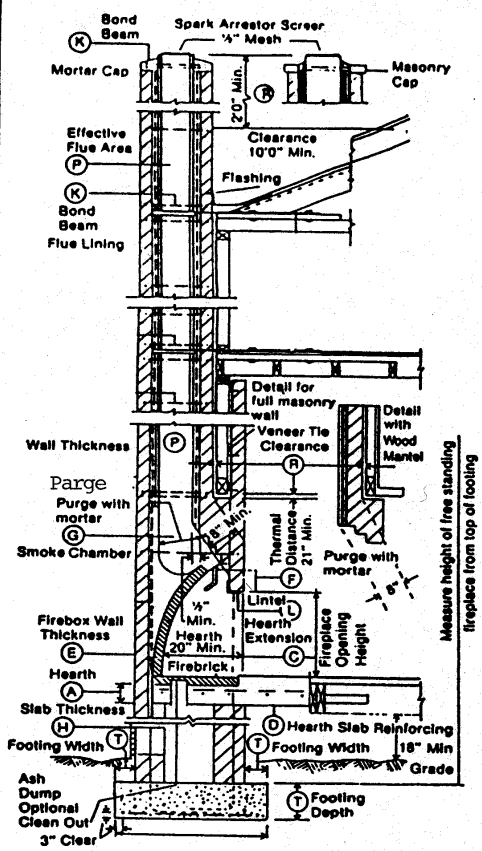
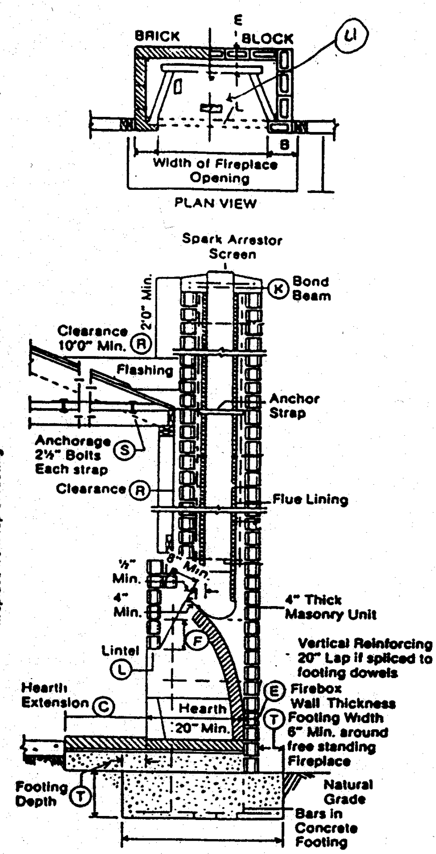


BRICK FIREBOX AND CHIMNEY— SECTIONAL SIDE VIEW ON WOOD FLOOR



BRICK FIREBOX AND CHIMNEY— SECTIONAL SIDE VIEW ON CONCRETE SLAB

A	Hearth Slab Thickness	U Outside Air to Front of Fireplace
B	Hearth Extension (Side)	
C	Hearth Extension (Front)	
E	Thickness of the wall of Firebox	
F	Distance from Top of Opening to Throat	
G	Smoke Chamber	
P	Flue Area Per Sq. Inch of Fireplace Opening (1:10 min)	
R	Clearances – (21" min)	
T	Footing	

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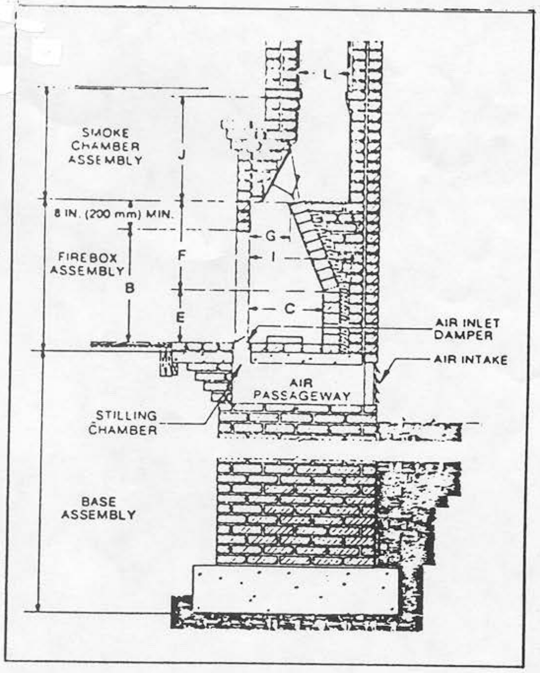
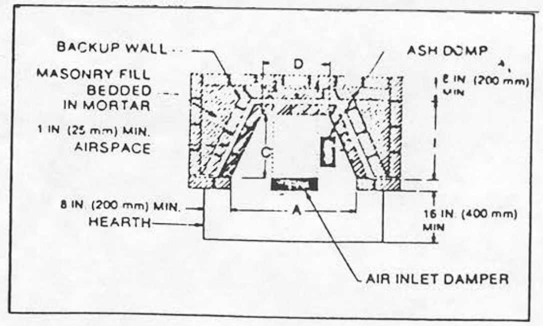
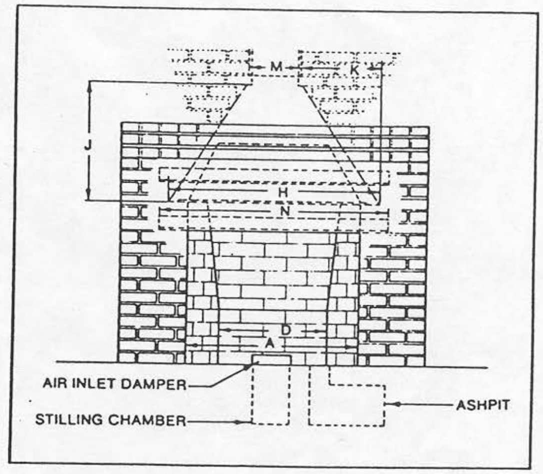


Single-Face Fireplace Section
FIG. 1a



Single-Face Fireplace Plan
FIG. 1b



Single-Face Fireplace Front Elevation
FIG. 1c

Multi-Face

Although generally associated with contemporary design, the multi-face fireplace is also of ancient origin. For example, the so-called corner fireplace which has two adjacent open sides has been in use for several hundred years in Scandinavia.

Multi-face fireplaces may have adjacent, opposite, three and even all faces open. Some of these may present design problems which must be solved before satisfactory performance can be expected. Multi-face fireplaces will be discussed in another issue of *Technical Notes* in this series.

FIREPLACE DESIGN

General

While the design recommendations given here are for single-face fireplaces, all fireplaces include the same basic assemblies. These are the base assembly, firebox assembly and smoke chamber assembly.

Base Assembly

The base assembly consists of the foundation and hearth support, as shown in Figs. 1 and 2. It is not necessary that all of these components be present. For slab-on-grade construction, the slab may act as both the foundation and the hearth support, providing it is properly designed.

Foundation. Masonry fireplaces should be supported with an adequately designed foundation. A typical foundation is illustrated in Figs. 1 and 2. This foundation may consist of footings which may support either foundation walls or a structural slab. Local building codes may differ as to permissible soil pressures for foundations. The *minimum* requirements contained in many building codes for the various foundation components are:

The slope of the smoke chamber should be smooth with each course of brick corbeled to achieve the required size. The inside of the smoke chamber should be parged to reduce friction and prevent smoke leakage. Figure 1 shows the shape and Table 1 gives recommended dimensions for the smoke chamber.

The front wall above the throat should be supported by a steel angle, *not* by the damper. There should be a noncombustible, compressible material, such as fibrous insulation, between the damper and the steel lintel and adjacent brick masonry to allow for expansion of both the damper and the lintel.

Chimney Flue

Proper draft is affected by both the area of the flue and the height of the chimney. Table 1 includes recommended flue areas. Both the area of the flue and the height of the chimney are discussed in detail in *Technical Notes* 19B, Residential Chimneys, Design and Construction.

ENERGY EFFICIENCY WITH FIREPLACES

General

Energy-efficient fireplaces may be used for supplemental heating to decrease the consumption of nonrenewable resources. A few modifications of conventional fireplace design can go a long way toward making them more energy-efficient. When operating the fireplace, it is recommended that the mechanical heating system be turned down, or off.

Location

For maximum thermal benefit, the fireplace should be located entirely within the structure. This enables the mass of the fireplace to store heat within the house. Heat is then radiated from the brick masonry into the room long after the fire has gone out because of the heat that is stored in the brick masonry.

By choosing a central location, a more even heating of the living area can be attained. Cold spots in areas away from the fire are kept to a minimum and, if the unit is an air-circulating type, heat can be vented into adjacent areas more efficiently.

Outside Air

One way to increase the efficiency of a fireplace is to use air from outside the structure for combustion and draft. Conventional fireplaces draw air from the room that has already been heated at some expense. The drop in room air pressure, caused by this air loss, may result in increased infiltration.

There are many ways in which outside air can be brought into the firebox area. One example is shown in Figs. 1 and 2. In general, whatever method chosen will require three (3) basic parts. These are: the *intake*, the *passageway*, and the *inlet*. To keep the fireplace from becoming a source of infiltration when not in use, tight-fitting inlet dampers and tight-closing intake louvers are required.

Intake. The intake should be located on an outside wall, or in the back of the fireplace. A screen-backed, closeable louver is required. Preferably, this will be one that can be operated from inside. Many building codes will not permit the intake to be located within the garage. Other possible locations for the intake are in a crawl space, or other unheated areas.

Passageway. A passageway or duct connects the intake to the inlet. Many options are available as to the size and material used for the passageway. Ducts ranging from approximately 6 sq in. (3870 mm^2) to 55 sq in. (35 500 mm^2) have been used successfully. The passageway can be built into the base of the fireplace assembly, or channeled between floor joists. It can also enter above the base of the fireplace and connect to inlets located in the sides of the firebox. In any case, the passageway is usually insulated to reduce heat loss.

Inlet. The inlet brings the outside air into the firebox. A damper is required to control the volume and direction of the air. This is necessary because cold exterior air brought into the fireplace expands and could possibly result in more air than is needed for draft and combustion, and create roll-off into the room prior to the air being warmed. The inlet can be located in the sides or the floor of the combustion chamber, preferably in front of the grate. If the inlet is located toward the back of the combustion chamber, ashes may be blown into the room, either by downdrafts from the flue, or updrafts through the inlet. A potential problem due to increased velocity of the air coming through the inlet is that the temperature within the combustion chamber can be increased significantly. This can result in grates and inlet dampers being literally burned up as a result of higher temperatures. To help decrease the velocity of the air through the inlet, a space before the inlet should be constructed as a stilling chamber, as shown in Figs. 1 and 2.

Glass Fireplace Screens

Glass screens should be used on both conventional fireplaces and fireplaces with an outside air supply. These screens should be closed when the fire is out or smoldering and before it is safe to close the damper because of flue gases and smoke. Glass screens provide a barrier that will keep heated air from escaping up the chimney, but still allow residual smoke and fumes to get out. These screens should be sealed around the edges and have tight-fitting doors and vents so that the fireplace is not a source of infiltration when not in use.

Caution is necessary when fireplaces are operated with the glass screens in a closed position. Increased temperatures due to higher air velocities through intakes can cause problems.