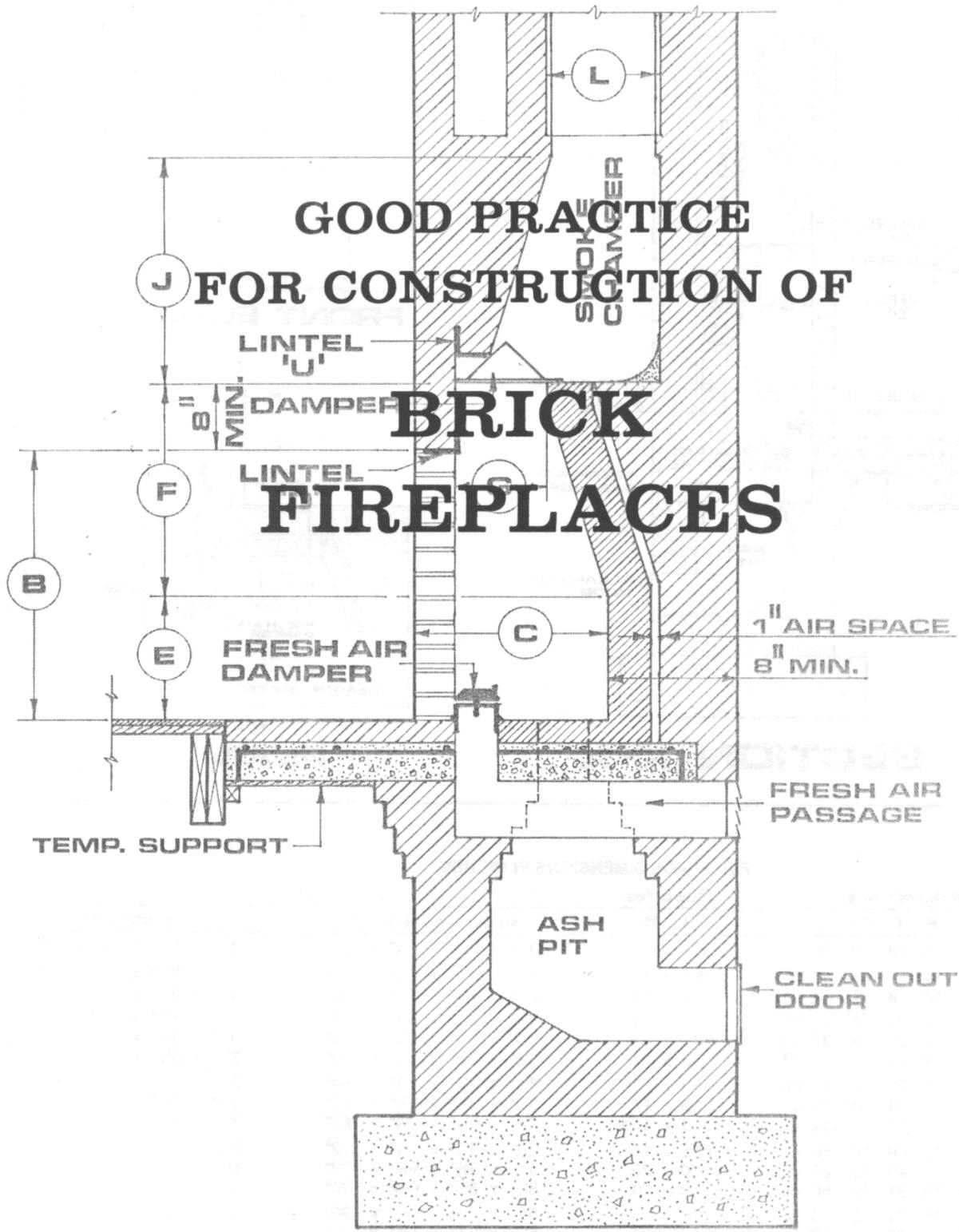
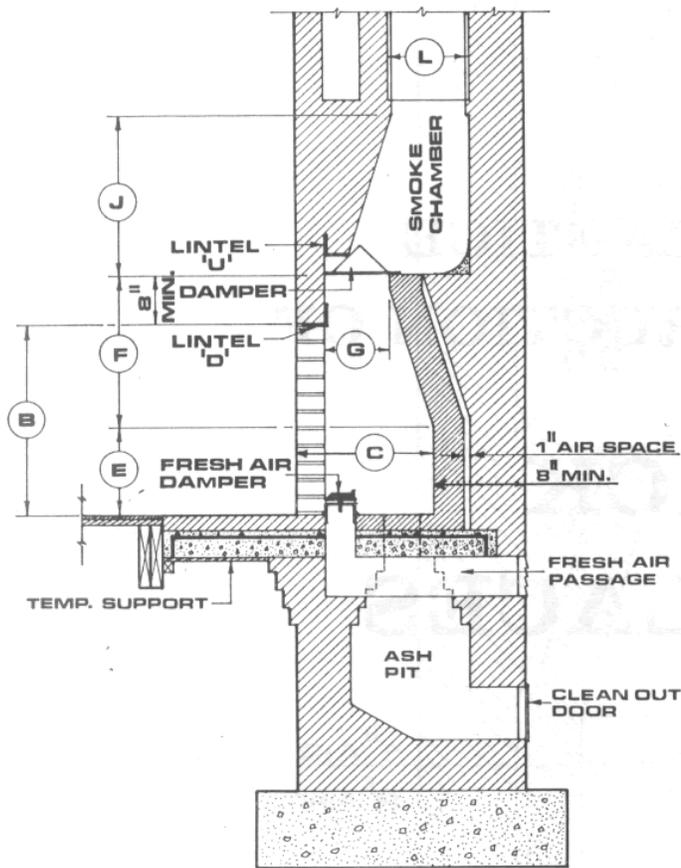


GOOD PRACTICE FOR CONSTRUCTION OF

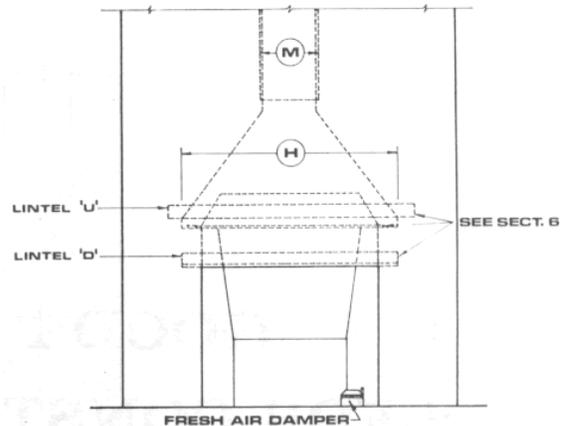
BRICK FIREPLACES



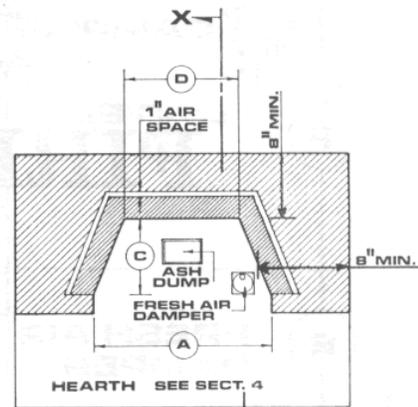
CONSTRUCTION DETAILS
Adapted from Donley Brothers Company



SECTION X-X



FRONT ELEV.



PLAN

FIREPLACE DIMENSIONS IN INCHES

General Dimensions										Flue Sizes ²		Lintels			
A	B	C	D	E	F	G ¹	H	J		L	M	Smoke Chamber (U)		Profile (D)	
24	24	16	11	14	18	9	30	19		8½ x 13		3½" x 3½" x ¼" x	38"	3½" x 3½" x ¼" x	32"
26	24	16	13	14	18	9	32	21		8½ x 13		3½" x 3½" x ¼" x	40"	3½" x 3½" x ¼" x	34"
28	24	16	15	14	18	9	34	21		8½ x 13		3½" x 3½" x ¼" x	42"	3½" x 3½" x ¼" x	36"
30	29	16	17	14	23	9	36	24		13 x 13		3½" x 3½" x ¼" x	44"	3½" x 3½" x ¼" x	38"
32	29	16	19	14	23	9	38	24		13 x 13		3½" x 3½" x ¼" x	46"	3½" x 3½" x ¼" x	40"
36	29	16	23	14	23	9	42	27		13 x 13		3½" x 3½" x ¼" x	50"	3½" x 3½" x ¼" x	44"
40	29	16	27	14	23	9	46	29		13 x 13		3½" x 3½" x ¼" x	54"	3½" x 3½" x ¼" x	48"
42	32	16	29	14	26	9	48	32		13 x 17¾		3½" x 3½" x ¼" x	56"	3½" x 3½" x ¼" x	50"
48	32	18	33	14	26	9	54	37		13 x 17¾		3½" x 3½" x ¼" x	62"	3½" x 3½" x ¼" x	56"
54	37	20	37	16	29	10	60	45		17¾ x 17¾		3½" x 3½" x ¼" x	72"	3½" x 3½" x ¼" x	66"
60	37	22	42	16	29	12	66	45		20 x 20		5" x 3½" x 5/16" x	78"	5" x 3½" x 5/16" x	72"
60	40	22	42	16	31	12	66	45		20 x 20		5" x 3½" x 5/16" x	78"	5" x 3½" x 5/16" x	72"
72	40	22	54	16	31	12	78	56		20 x 20		5" x 3½" x 5/16" x	90"	5" x 3½" x 5/16" x	84"
84	40	24	64	20	28	12	90	61		24 x 24		5" x 3½" x 5/16" x	102"	5" x 3½" x 5/16" x	96"
96	40	24	76	20	28	12	102	75		24 x 24		5" x 3½" x 5/16" x	114"	5" x 3½" x 5/16" x	108"

¹Approximate size. Check with your damper supplier.

²Rectangular non-modular clay flue linings (nominal outside dimensions shown).

Good Practice for Construction of Fireplaces

Popularity of the fireplace has never diminished, but since energy prices are steadily rising, the fireplace has become increasingly important as a source of heat.

Since the fireplace is being used more often and is being subjected to sustained high temperatures, extra care should be taken in design and construction of both firebox and chimney.

Fireplace shape and dimensions are shown in the drawings and table on page 2. While the illustrated details were not determined by scientific analysis, they have proven successful over a period of many years' use in normal situations. The technical information provided in this brochure is intended to conform to the standards of CABO 1 & 2 family dwelling code with NC & 1992 CABO amendments.

Section 1: Foundation

When a design is not provided, foundations for masonry fireplaces and their chimneys should be constructed of concrete or solid masonry at least 12 inches thick and extend at least 12 inches beyond the fireplace supporting wall on all sides. Bottom of footings should be founded on natural undisturbed earth below frost depth. In areas not subject to freezing, bottom of footings should be at least 12 inches below finished grade.

The services of a structural engineer may be required to properly design footings for large chimneys in soils of questionable bearing value. Foundation walls are built with solid brick work, except where ash pit is required.

Section 2: Fireplace Size

Fireplace size should be in proportion to room size. Extra large fireplaces do not necessarily produce more heat than smaller structures. A U.S. Department of Agriculture publication states that "A fireplace 30 to 36 inches wide is generally suitable for a room having 300 square feet of floor." Width and other fireplace dimensions may be increased proportionally for larger rooms. See table on page 2 for fireplace dimensions.

Section 3: Fresh Air Duct

Details of ductwork and adjustable fresh air damper are shown in the drawings.

By bringing outside air directly into the firebox to supply combustion air and air for the required chimney draft, heated room air is not taken from the living spaces. Combined with glass doors, the fire size can easily be controlled with the adjustable damper located on the firebox floor.

Section 4: Hearth Construction

Fireplace hearth construction must be made of non-combustible materials and must be wholly supported by the chimney structure. The hearth and the hearth extension must extend a minimum of 36 inches from the back of the firebox to the end of the hearth extension. When a fireplace opening is 6 square feet or larger, the hearth extension must extend at least 20 inches in front of the fireplace facing material, and at least 12 inches beyond each side of the fireplace opening. When the opening is less than 6 square feet, the hearth extension may extend 16 inches in front and 8 inches from the sides of the opening. Wooden forms or centers used during the construction of the hearth and hearth extension shall be removed when the construction is completed.

Section 5: Firebox and Smoke Chamber

Fireplaces should be constructed of solid masonry units. Where a lining of firebrick at least 2 inches in thickness or other approved liner is provided, the total thickness of back and sides, including the lining, should be not less than 8 inches. Where no lining is provided, the thickness of back and sides should not be less than 12 inches.

Firebrick should meet ASTM Specification C 64-72 for regular high duty fireclay refractory brick. Dimensions of these brick are usually 4 1/2 inches x 2 1/2 inches x 9 inches.

In constructing the firebrick lining, a one inch air space should be provided between lining and the solid brick structural walls to allow for expansion. Firebrick should always be laid flat (4 1/2" dimension) when one inch air space is used. See details on page 2.

Table No. R-903.1 of the Code allows firebrick to be laid with Type M or S Mortar or Type N with fire clay additive and with tight fitting joints. A recommended job-mixed refractory air setting mortar is as follows (by volume):

- 1 part Portland cement (type 1)
- 1 part Ohio type fireclay
- 1 part sand

Keep joints as thin as possible.

Dry mixed air setting refractory mortar, such as "Flue Tite" by Kopp Clay Company and "Heat Stop" by Superior Clay Corporation, is available from fire brick and flue lining distributors and from some building supply may be water soluble until set by extended use of the fireplace.

Firebox should have a minimum depth of 16 inches from fireplace facing material. The inner surfaces of the smoke chamber should not be inclined more than 45 degrees from vertical. Joints shall be struck smooth to clear excess mortar.

Section 6: Lintels and Dampers

Recommended sizes are shown in the drawings and tables on page 2. All materials expand when heated, but metals normally expand more than brick over a given temperature increase. For this reason a minimum of one-half inch space must be left at ends of all lintels and dampers to allow them to "grow" without cracking the brickwork. In order to prevent mortar from falling into the spaces left open for metal expansion, mineral wool or fibrous insulation should be placed in the opening.

A second fireplace lintel is required above the damper to prevent dead weight of the smoke chamber and chimney from resting on the damper. This allows the damper to expand freely in all directions without damaging brickwork.

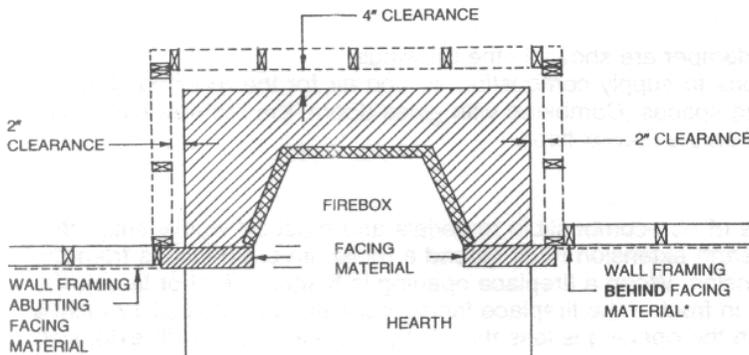


Fig. 1
PLAN VIEW: TYPICAL INTERIOR FIREPLACE

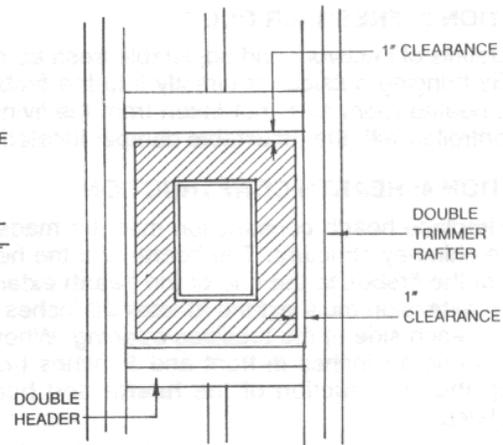
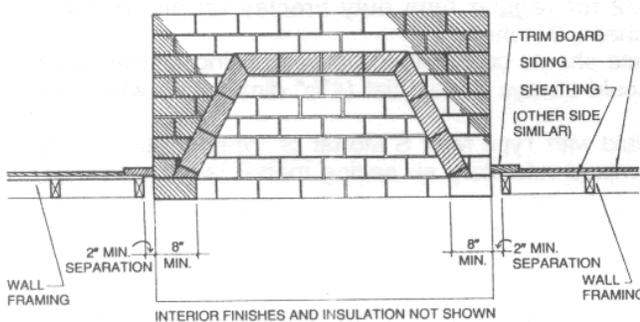
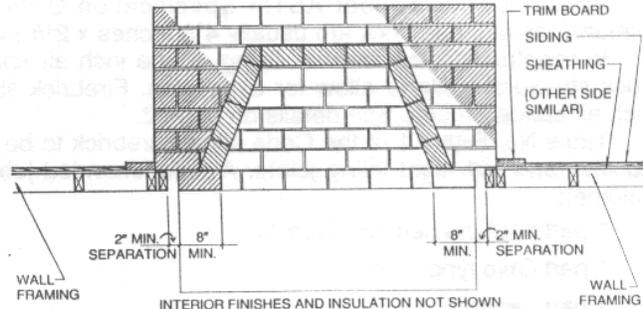


Fig. 2
PLAN VIEW: TYPICAL INTERIOR CHIMNEY



MASONRY CHIMNEY ON EXTERIOR OF BUILDING
(ALT. #1)



MASONRY CHIMNEY ON EXTERIOR OF BUILDING
(ALT. #2)

Section 7: Adjoining Wood Framing

All wood framing members should be kept at least one inch from chimney masonry and two inches from fireplace masonry, excluding the fireplace facing material. Masonry chimneys which are completely on the exterior of a building against the sheathing are not required to comply with these provisions. Woodwork, such as studs and paneling, should not be placed within four inches of the back of masonry fireplaces. (See details on page 4.) Note: Ends of wood girders may be supported on a corbelled shelf of a chimney.

Woodwork or other combustible materials should not be placed within 6 inches of a fireplace opening. Combustible material within 12 inches above the fireplace opening should not project more than 1/8 inch for each distance from such opening.

Section 8: Chimney and Flues

Chimneys must be constructed with fireclay flue linings encased in not less than 4 inches of solid masonry (built with solid masonry units). Where the walls of masonry chimneys are less than 8 inches in thickness, an air space should be left between the lining and the surrounding brickwork. Square or rectangular flues from fireplaces should not be less than 1/10th of the face area of the fireplace opening or the combined areas of fireplaces with 2 or more faces. Round lining should not be less than 1/12th the face area of fireplace opening (or openings). (See Tables 16A and 16B for details.)

Where two flues adjoin each other in the same chimney with only flue lining separation between them, the joints of the adjacent flue linings should be staggered at least 7 inches. Where more than two flues are located in the same chimney, masonry wythes at least 4 inches wide and bonded into the masonry walls of the chimney must be built at such points between adjacent flue linings that there are not more than two flues in any group of adjoining flues without such wythe separation.

Masonry chimneys for low heat appliances must be lined with approved fireclay flue liners (meeting ASTM C315-87) not less than 5/8 of an inch in thickness, or with other approved liner of material that will resist a temperature of 1800°F without softening or cracking.

Fireclay flue liners should be installed ahead of the construction of the chimney as it is carried up, carefully bedded one on the other in Type M, Type S, Type N, or refractory mortar with close fitting joints left smooth on the inside. See Section 5 for recommended Refractory Air Setting Mortars.

Flue liners should start at a point not less than 8 inches below the intake, or, in the case of a fireplace, from the top of the smoke chamber. If a change in direction is necessary, lining joints shall be made tight not only by mortaring but also by mitering or cutting equally the end of each adjoining section. The chimney should be as vertical as possible with a maximum slope no greater than 30 degrees from vertical for the entire height of the chimney. All mitered joints should be visible from either the top or bottom side of the chimney. This is necessary to keep heat, smoke, gasses and creosote within the lining. No cracked or broken lining sections should be used.

Table 16A

Rectangular and Square Clay Flue Lining

Nominal Outside Dimensions (Inches) (1)	Net Free Area (Inches)
8 ¹ / ₂ x 8 ¹ / ₂	49
8 ¹ / ₂ x 13	76
8 ¹ / ₂ x 17 ³ / ₄	102
13 x 13	127
13 x 17 ³ / ₄	173
17 ³ / ₄ x 17 ³ / ₄	233
20 x 20	298
20 x 24	357
24 x 24	431

Table 16B

Round Clay Flue Lining

Nominal Inside Dimensions (Inches) (1)	Net Free Area (Inches)
8 ± 1/4	50
10 ± 5/16	78
12 ± 3/8	113
15 ± 3/8	177
18 ± 7/16	254
21 ± 7/16	346
24 ± 1/2	452

(1) Variations of 1/2" in outside dimensions and 1/8" in wall thickness permitted.

Section 9: Stove Flues

Due to the uncertainty of energy availability and prices, some builders are placing an extra flue in new chimneys in the event that a wood or coal burning stove may be used as the main source of heat in the future.

A thimble is used to connect the stove pipe to the flue. The thimble is made of fireclay or equivalent material and is required to extend into the flue lining where it will be flush with inner face of the lining and should be sealed with a high temperature, acid resistant mortar. See Section 5 for suggested mortars.

Flues for equipment burning solid or liquid fuels should have a minimum outside dimension of 8 1/2" x 8 1/2" in size or equivalent area and comply with ASTM-C315. A thimble is required for connection fuel burning equipment to flues. Where thimbles are required, a flue liner manufactured with an integral thimble opening should be used.

Special flue lining sections with pre-cut thimble holes are available from local building supply dealers.

In constructing flues for stoves, the lining must start from a point not less than 8 inches below the bottom of the thimble. Metal cleanout doors should be installed at base of flue linings serving stoves to facilitate soot and creosote removal. When soot pocket extends more than 12 inches below the thimble, ash dumps should be provided. Ash dumps, when used, should empty into a fireproof compartment or pit which must have a metal cleanout door. The cleanout door should have a diameter of at least 5 inches.

Section 10: Chimney Height

Chimneys shall extend at least 2 feet above the highest point where they pass through the roof of a building and at least 2 feet higher than any portion of the building within 10 feet.

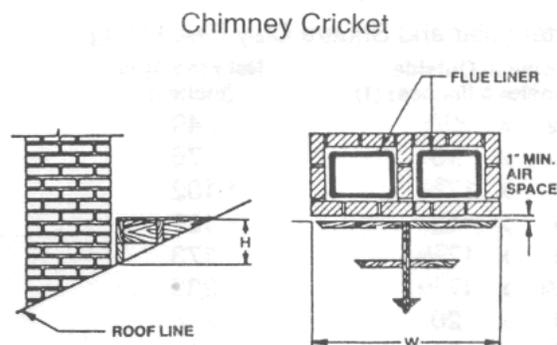
This code requirement is primarily for fire safety precautions. However, chimney heights may need to be extended well above the minimum level to obtain an adequate draft for the fireplace. For chimneys with low overall height (less than 15 feet between damper and chimney top) HUD recommends increasing the ratio of flue lining area to fireplace opening from 1/10th to 1/8th.

Obstructions, such as nearby trees, structures, hillsides, etc. may cause chimney "down drafts" and this might also require extending chimney height well above the level required by building codes. Chimney caps also have proven successful in elimination down drafts.

Section 11: Chimney Crickets and Flashing

A chimney should be provided with crickets or chimney saddles when the dimension parallel to the ridgeline is greater than 30 inches and does not intersect the ridgeline. The intersection of the cricket or chimney saddle and the chimney should be covered and flashed so as not to leak. Chimneys should be flashed with corrosion-resisting flashing and counter flashing built into mortar joints.

ROOF SLOPE	H
12 - 12	1/2 of W
8 - 12	1/3 of W
6 - 12	1/4 of W
4 - 12	1/6 of W
3 - 12	1/8 of W



"After Completion" Suggestions

1. The builder should not permit his crew to use the fireplace for heating purposes or rubbish disposal during construction.
2. The all-masonry fireplace should be allowed to "cure" at least 40 days before building a fire.
3. The first few fires should be of low intensity to slowly evaporate any moisture remaining in structure.