

Building a Rumford fireplace

Easy to construct, this energy-efficient tall and shallow fireplace is enjoying renewed popularity

By Jim Buckley

Rumford fireplaces are more popular now than at any time since 1850. Their traditional proportions look appropriate in homes with higher ceilings, which are growing in popularity. And their legendary heating efficiency attracts builders who are concerned with air quality. Over the past four years, U.S. building codes have been changed, where necessary, to permit these tall and shallow fireplaces.

Inventor Count Rumford, an expert on the nature of heat, published essays on fireplace construction in the 1790s. Although born Benjamin Thompson in Woburn, Mass., he was a loyalist who fled with the British in 1776 and conducted most of his fireplace research in England. He spent much of his life as an em-

ployee of the Bavarian government, which gave him the title "Count of the Holy Roman Empire."

Count Rumford understood that the only useful heat generated by a fireplace is radiant heat. So he designed a fireplace with a tall, wide opening; a very shallow firebox; and widely splayed covings, or jambs, to reflect as much radiant heat into the room as possible.

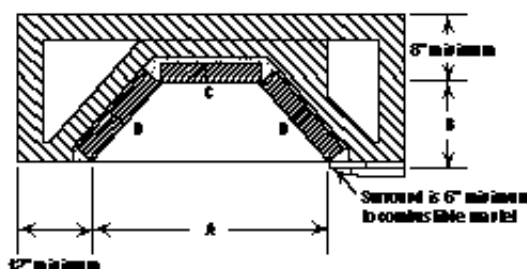
Intuitively understanding fluid dynamics, Count Rumford also streamlined the throat, or in his words, "rounded off the breast" in order to "remove those local hindrances which forcibly prevent the smoke from following its natural tendency to go up the chimney." He essentially created a venturi that, like an inverted carburetor, shot the smoke and air up through the throat and into the receiving smoke chamber.

Unfortunately, many fireplace designers and builders since Count Rumford's time have misinterpreted his ideas and modified his designs. Some have failed to streamline

the throat, for example. Indeed, the most popular 20th century book on Rumford fireplaces is Vest Orton's *The Forgotten Art of Building a Good Fireplace*, now in its 23rd edition, which seems to combine the worst of the 18th and 19th century myths and interpretations.

But luckily, Rumford's essays on fireplaces, although out of print, are still readily available in libraries. The easiest to obtain is *The Collected Works of Count Rumford*, edited by Sanborn Brown (See Ref. 1).

In fact, Count Rumford may not have known how ingenious his "rounded breast" really was. Testing a Rumford at a brick manufacturing plant, we wanted to see if the flow through the throat is laminar—that is, with the air and combustion gases in layers rather than mixed togeth-



Rumford Fireplace Dimensions

Fireplace Size	Throat (AxF)	Damper (frame)	Smoke Chamber (base x G)	Flue Tile	Other Dimensions:						
					A	B	C	D	E	F	G
24" wide	24"x12"	4"x16"	8.5"x18"x24"	8.5"x13"	24"	12"	13.5"	13.5"	24"-28"	12"	24"
30" wide	30"x12"	9"x24"	13"x27"x30"	13"x13"	30"	12"	13.5"	15"	28"-32"	12"	30"
36" wide	36"x14"	9"x24"	13"x27"x30"	13"x13"	36"	14"	13.5"	18"	32"-38"	14"	30"
42" wide	42"x15"	9"x30"	13"x34"x30"	13"x18"	42"	15"	15"	21"	38"-42"	15"	30"
48" wide	48"x16"	9"x30"	16"x34"x30"	16"x20"	48"	16"	18"	22.5"	42"-48"	16"	30"

Diagrams and table show dimensions of Rumford fireplace components.

er. So we placed two thermocouples at the narrowest part of the throat—one near the curved breast and one a couple of inches farther back near the fireback. To our amazement, with an established 1,700° F fire, we recorded only 75° F near the curved breast and 730° F near the fireback.

That proved that the flow is laminar: The room air coming in over the fire doesn't mix with the hot products of combustion;

rather, it acts like an invisible glass door, keeping the smoke behind it, as they both go up through the throat together.

This revelation has far-reaching implications. Most engineers who are trying to come up with clean-burning designs to meet EPA emission standards assume it can't be done with an open fireplace because, they say, the excess air mixes with and cools the gases too much to achieve secondary combustion.

What we've found is that the excess air does not mix turbulently with the products of combustion in a Rumford fireplace with a streamlined throat. Instead, the products of combustion stay isolated and hot behind the clean room air. And since a Rumford is tall, the gases driven off the fire stay hot for a long time—long enough to attain secondary combustion. (Emission tests are now being conducted on Rumford fireplaces.)

Straight fireback advantage

Used to building modern fireplaces, most masons have trouble believing a Rumford will draw until they see it happen. The rules are different. In a modern fireplace, the fireback usually is sloped or rolled forward, casting the products of combustion forward. The incoming room air spills over the sharp edge of a

steel lintel and mixes turbulently with the smoke.

Most masons assert that you need to "cross over" or drop the lintel about 8 or 9 inches below the damper to create a pocket for this smoke and allow the incoming room air to "roll"; if you don't, the fireplace will smoke, they argue.

Of course, inefficiently turbulent smoke and air need a huge throat to get through. But by keeping the fireback straight and rounding the breast to achieve streamlined air flow, we can build Rumford fireplaces with throats less than half the size of a modern fireplace and with openings almost a foot taller. No wonder Rumfords are more efficient. They radiate more heat and waste less heated room air.

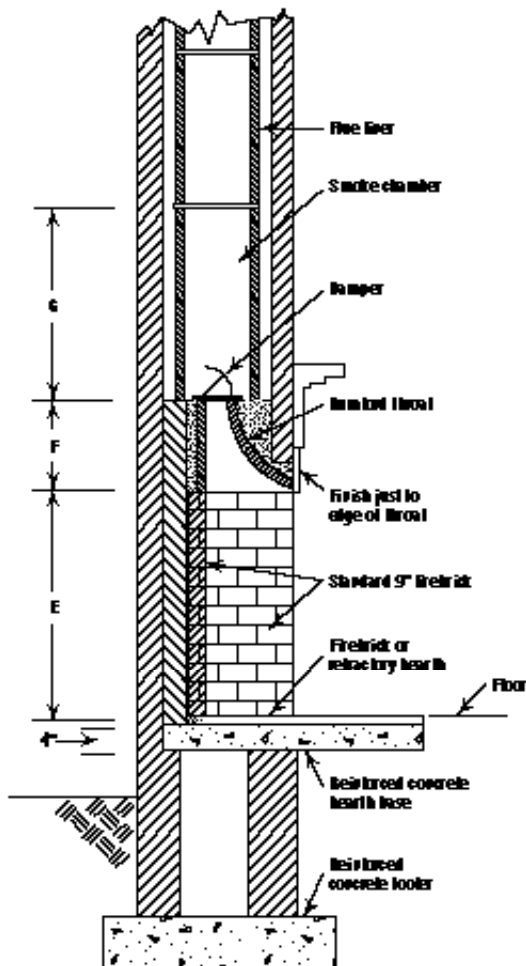
Here's how to build a Rumford fireplace using a rounded fireclay throat and a two-piece smoke chamber:

Firebox

Build the Rumford firebox using standard 9-inch firebrick and refractory mortar, following the dimensions shown in the accompanying table and diagram (page 403). Keep the joints 1/8 inch or less. Fill any voids, and wash the firebox with a sponge and plain water.

The firebox must be backed up with solid concrete masonry units, so that the firebox walls are at least 8 inches thick. Fill the space between the firebrick and the concrete block with ordinary mortar.

Rumford fireplaces usually are about as tall as they are wide; however, lowering the height by a few inches can improve the draw.





Build the Rumford firebox with 9-inch standard firebrick; then set the curved Rumford throat in the refractory mortar on top of the firebox.

This is especially helpful in larger Rumfords because homeowners tend to build fires too small for the size of the fireplace.

Build the firebox as tall as the opening will be, and then build the fireback up another three courses. The covings will have to be built up to meet the rounded Rumford throat but only after the throat has been set in place.

Throat

Set a prefabricated, one-piece curved Rumford throat in fireclay mortar on top of the firebox. These throats come in 24-, 30-, 36-, 42-, and 48-inch widths.

Pack the area between the throat and the surround masonry solid with ordinary mortar as you lay up masonry courses to the top of the throat. Although the throat is designed to carry the load, for an extra margin of safety, place a length of rebar in the first mortar joint above the front edge of the throat, which is 1½ inches thick.

Finish the firebox by building the curved covings up to meet the curved throat as high as the fireback and the top of the throat. Fill in the space between the firebrick and the throat with fireclay mortar.

Lay the surrounding masonry up to the top of the throat and the fireback to create a platform above the hearth on which to set

the damper and smoke chamber.

Damper

Set the flat cast-iron damper over the opening left by the throat and the firebrick back. This damper should be set in a bed of wet mortar, but not restricted by any additional masonry laid around it. Make sure the valve plate is free to open. Close the valve.

Smoke chamber

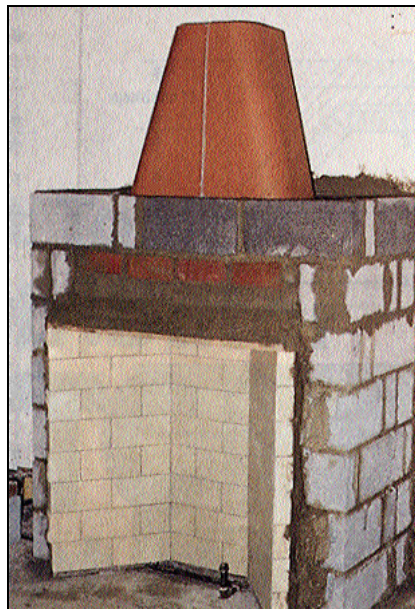
Set the smoke chamber over the damper, making sure that the damper is free to open. The smoke chamber may be shifted to one side or the other, forward or backward, or leaned to line up with the chimney so long as the damper valve opens without striking the inside of the smoke chamber.

If installing a two-piece smoke chamber, fill the joints between the two halves with fireclay mortar. Lay up the surrounding masonry at least 4 inches thick around the smoke chamber.

Now you're ready to set the first flue tile and continue the chimney just as you would any masonry chimney.

The surround

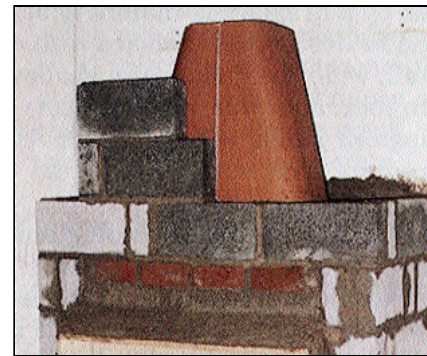
Finish the surround (the area




Set the smoke chamber over the damper, making sure the damper will open and close freely.

about 6 inches wide around the fireplace opening) with plaster or a relatively thin material such as marble, slate, or tile. Adding a brick or stone facing that projects into the room 4 inches or more interrupts the line of the coving and makes the fireplace unnecessarily deep. Traditionally, Rumford fireplace surrounds were plastered and often painted black.

At the top of the fireplace opening, place the finish material just low enough to cover the edge of the throat, but maintain the line of the streamlined throat. This curve is like the leading edge of



Lay surrounding masonry at least 4-inches thick around the smoke chamber.

an airplane wing. Don't ruin the air flow by dropping a header several inches below the opening. Again, because it is difficult to maintain the streamlining, try to avoid a brick surround that would require an angle lintel to support the header. 

References

1. *The Collected Works of Count Rumford*, volume 2, edited by Sanborn Brown, Harvard Press, 1969.
2. *The Forgotten Art of Building a Good Fireplace*, by Vrest Orton, Yankee Press, Dublin, N.H., 1969.

Jim Buckley is president of Buckley Rumford Fireplace Co. in Seattle.

The diagrams and all photos were provided by Superior Clay.

PUBLICATION #M930402

Copyright © 1993, The Aberdeen Group
All rights reserved