The following is for those who need further construction details of our hybrid masonry woodstove, or who might want a better explanation of why we've gone to all this trouble to heat our house. First an overview of the concept of house ventilation.

Houses built for cold, windy climates are sealed tightly against *unintentional* air infiltration. This helps to lower the number of whole-house air exchanges per hour, reducing the amount of air you're heating (or cooling). This also lowers your heating/cooling bills or the amount of firewood you need to gather. But any indoor air contaminant, including the CO^2 you're exhaling, builds up to higher levels in a well-sealed home. So it's important to design BOTH for *adequate ventilation* AND *reduced air exchange* by controlling air input and output, and by regulating the temperature and humidity of incoming air.

Many homes now use a motorized heat exchanger to send some of the heat lost to ventilation back into the incoming airstream. Motors use a lot of energy, so if you can do this *passively* or utilize a *renewable* energy source the overall efficiency of your home increases. We use a combination of these practices. On sunny days, an 8-watt solar (photovoltaic) panel powers a recycled, Cray Supercomputer cooling fan, pushing outdoor air through a simple, glass-covered, solar air heater and into our house. The air is dryer than indoor air and usually hovers around 130° F. And we use the "dumping" of combustion gases from our wood fires to passively power the air exchange process when the Sun is more shy.

Working backwards from the chimney, combustion gases from our woodstove exit the house at this point. To get there they travel through 12 feet of 6-inch diameter stovepipe running inside 2 tons of brick, mortar, and refractory cement (also known as fire clay, "Heat Stop", etc.). This stores some otherwise lost heat for later re-radiation into the house, evening out the drastic temperature fluctuations caused by burning a hot, well-oxygenated, highly efficient fire.

The stove itself pulls air for combustion from an adjustable air input slot about a foot off the floor. From this slot, cool, moist, "stale" room air leaves the house *and must be replaced*. Our stove has a ceramic "afterburner" that uses some incoming air to ensure a more complete burn of the wood's hydrocarbon gases. There is an airspace around the afterburner, which can be connected to an electric fan for blowing additional warm air around the house. In previous houses I used a larger stovepipe surrounding the actual chimney pipe as an air preheater. Cold air entered this airspace at a point nearest the stove (the hottest spot), was heated along its length, and exited into the room where the pipe ended.

The problem with fast moving, fan-blown air is that the air movement evaporates skin moisture, making you feel cooler. Obviously this is counterproductive when you're trying to get warmer! So we connected the fan port to an insulated, flexible duct that leads outdoors. When the stove is burning, the gases leaving through the chimney create an air pressure deficit. The lowered air pressure sucks air in through the duct, around the afterburner, and into the house at a low velocity. So we get hotter, dryer, fresher air into the house without excessive, skin-cooling air circulation.

In terms of actual construction detail, we bought everything "off the shelf". Harmon Stove Company, 352 Mountain House Road, Halifax, PA, manufactured our stove. We purchased it in 1999, from American Home Fireplace & Patio in West Salem, WI. It's the "Exception" model TL-200, and it cost $1523 plus tax at that time. The triple-walled, Dura/Plus, insulated metal chimney system we used was purchased locally (see it at www.duravent.com).

The bricks and mortars were purchased in 2000 from Rochester Brick, 3705 Enterprise Dr. S.W., Rochester, MN. They delivered 400 "pretty" bricks for the unit's exterior called, "Autumn Antique", @ 56 cents/brick. The 240 bricks needed for interior layers that aren't seen were a mixture of colors, costing only 35 cents/brick. We used 7 bags of Type N mortar @ $6/bag, mixed with a deep brown rock powder colorant for the exterior bricks, using three 9-pound bags @ $10 each. And we ended up needing five 50-pound pails of pre-mixed refractory cement @ $40 each, plus another nine 15-pound pails @ $14 each.

As we built up the masonry, the steel stovepipe was wrapped in a couple of layers of rosin-coated "building paper", normally used between subfloors and hardwood flooring. The refractory cement was trowelled onto the pipes about an inch thick, then regular mortar and brick chips filled the remaining irregular spaces inside the brick structure. The reason for this is two-fold. During the first few "cool" firings, the building paper burns to an ash, leaving a small airspace between the metal stovepipe and the refractory cement. This expansion zone prevents either inward buckling of the hot metal pipe or cracking of the exterior mortar during really hot firings. And in the long run, when the internal stovepipes have "burned out" due to heat and corrosion, the cast-in-place refractory cement will still provide a smooth, crack-free smoke path.