

## Range Hoods

Range hoods are useful for venting cooking odors and excess moisture to the outdoors. As with nearly everything, you can have too much of a good thing! Oversized range hoods create a number of complications.

When air is exhausted from the kitchen, air from outdoors comes in to replace it. When it is cold out that air needs to be heated. A small range hood - say, 150 cubic feet per minute (CFM) - used briefly won't have a perceptible impact on the temperature of the room or the comfort of the cook. If we super-size that small hood to a 600 CFM hood it is equivalent to the amount of air coming from six large heating registers. The design heating load of most South Mountain houses is between 15,000 and 35,000 BTU/hour, depending on their size. By comparison, heating the make-up air for a 600 CFM hood to comfort temperature at a design outdoor temperature of 5°F requires 42,000 BTU/hour, and a 1,000 CFM hood requires 70,000 BTU/hour - it can easily triple the heating load of the house. The building code requires that a range hood of 400 CFM or more have a dedicated make-up air system. This is another fan that supplies air from outdoors to replace the air exhausted by the hood. We either increase the size of the heating system to heat that make-up air (expensive, and challenging with heat pumps) or we supply a specialty heater just for the make-up air. This is usually electric, and can require increasing the size of the electric service in some cases. We usually don't heat the make-up air all the way up to comfort temperature, yet heating 1,000 CFM to 60°F from a more typical winter temperature of 25°F requires a 10 kW heater (actually, 11 kW). An additional challenge is locating the register(s) that supply this make-up air in such a way that the air doesn't blow on people and cause comfort issues.

In the summer, if the kitchen is being cooled, the impact of a large hood on comfort can be even more noticeable, as the outdoor air carries a moisture load that overwhelms the capacity of the cooling system to dehumidify it.

In non-residential applications with continuous, very high ventilation rates (lab buildings, animal facilities) the entire mechanical system is designed around the ventilation load. In homes we don't do this, because the loads are so intermittent. As long as they stay intermittent, this is the right approach. Yet we work hard to right-size the range hood so as to minimize these problems. The hood control will be multi-speed or variable speed, so the hood can be operated at a rate well below peak, in which case all of the issues are reduced.

Finally, it's common that the actual extraction rate of a range hood is well below the nameplate rating of the hood, due to the pressure drop in the ducts and fittings. So we can find that a nominal 600 CFM hood is moving 375 CFM.