INFORMATION RESOURCES

Ventilation Guide

Armin Rudd, a ventilation expert and engineer at Building Science Corporation in Westford, Massachusetts, has written an eminently useful small book on residential ventilation. Rudd's 67-page Ventilation Guide includes 37 pages of detail drawings illustrating "best practice" ventilation systems for a variety of North American climates.

Rudd offers opinions based on engineering principles. For example, he lists three ventilation strategies, from the best performing to the worst performing: "From an engineering perspective, the best performing systems over all climates would range from a fully ducted, balanced heat- or energy-recovery system that operates continuously, to an intermittent central-fan-integrated supply system with available exhaust capacity, to a single-point exhaust fan located in a closeable room."

Specification Trade-Offs

Builders rarely choose equipment based on ideal performance; rather, equipment specifications usually involve a trade-off between perfection and cost. In that vein, Rudd usually advises builders to install a central-fan-integrated supply ventilation system with a passive fresh air duct conveying exterior air to the furnace's return air plenum (see Figure 16).

To avoid underventilation, such a system requires an AirCycler control to intermittently energize the furnace's blower during the swing seasons when neither the furnace, nor the air conditioner, is operating. Moreover, the system's fresh air duct requires a motorized damper (also controlled by the AirCycler) to prevent overventilation during summer and winter. To improve energy efficiency, builders choosing central-fan-integrated supply ventilation systems should specify a furnace with an ECM blower.

Of course, a home with a central-fan-integrated supply ventilation system still requires a range hood fan and bathroom exhaust fans to address sources of moisture and pollution.

Although Rudd often advises builders to install central-fan-integrated supply ventilation systems, he is aware of the advantages of dedicated ventilation ductwork. For example, in a discussion of heat-recovery and energy-recovery ventilators, Rudd notes, "Connecting both the HRV/ERV inlet and outlet to the central system return and supply ducts, respectively, or connecting both the inlet and outlet of the HRV/ERV to the central return duct requires coincident operation of the central fan. … It is better to provide a dedicated duct system independent of the central ducts."

Practical Advice

Rudd provides many useful pointers to builders unfamiliar with mechanical ventilation systems:

- "The entire air system must be substantially airtight."
- "Air intakes on shingle roofs can draw in asphalt fumes or odors. In summer, air taken from roofs is usually hotter than air taken from sidewalls. …

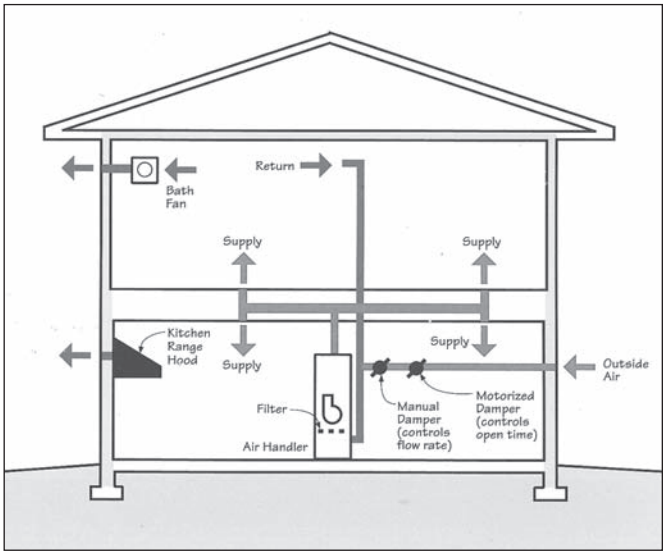

Figure 16. Central-fan-integrated supply ventilation systems include a passive fresh air duct that brings outdoor air to the main return duct. An AirCycler control and a motorized damper prevent underventilation or overventilation.

Therefore, it is not recommended to take ventilation air from the roof."

- "Fans used for ventilation should be [rated at] one sone or less, unless they are remotely mounted or part of the central air distribution system."

Rudd has a refreshing willingness to abandon conventional engineering solutions when required by common sense. He writes, "A lot of time and effort can be spent following engineering procedures to design the ducts and fittings of a ventilation system. The best known of these procedures is the Air Conditioning Contractors of America (ACCA) Manual D. However, that level of detail is usually not needed for residential ventilation systems. Following are a few simple, common-sense rules that will serve you well for most situations: … Start with the size of the fan outlet/inlet connection. Use that size [duct] if the duct length is fairly short (less than 10 feet). Increase the duct size 1 inch if the duct run is not long (less than 25 feet) and there are few fittings. … Go up 2 inches in duct size if the duct run is long or there are many fittings. … Don't ignore the odd sizes of 5 inch and 7 inch diameter duct. While they are less commonly stocked, they are available, and can make achieving the right air flow much easier."

The only significant weakness of Rudd's book is one shared by many authors: Rudd avoids mentioning brand names. Builders who want to know which brands of equipment to seek out, and which to avoid, will have to look elsewhere for product reviews.

Choosing A Ventilation Rate

Most indoor air quality experts recommend that residential ventilation systems be operated to meet ASHRAE 62.2 requirements (7.5 cfm per occupant plus 1 cfm for every 100 square feet of occupiable floor area). However, at least two engineers from the Building Science Corporation — Rudd and Joseph Lstiburek — argue in favor of lower ventilation rates. Rudd writes, "Experience with over 100,000 [Building America] homes having central-fan-integrated supply ventilation with fan and damper cycling has been successful. Those homes have roughly 50 to 60 percent of the ventilations rate required by ASHRAE Standard 62.2. The lack of complaints by occupants indicates that the systems are working to provide indoor air quality acceptable to the occupants."

Builders who choose to follow Rudd's advice should carefully consider opposing views before proceeding; both sides of the ventilation rate debate were presented in the January 2006 issue of EDU .

Ventilation Guide by Armin Rudd is available for $18 from Building Science Press, 70 Main Street, Westford, MA 01886. Tel: (978) 589-5100; Web site: www.buildingsciencepress.com