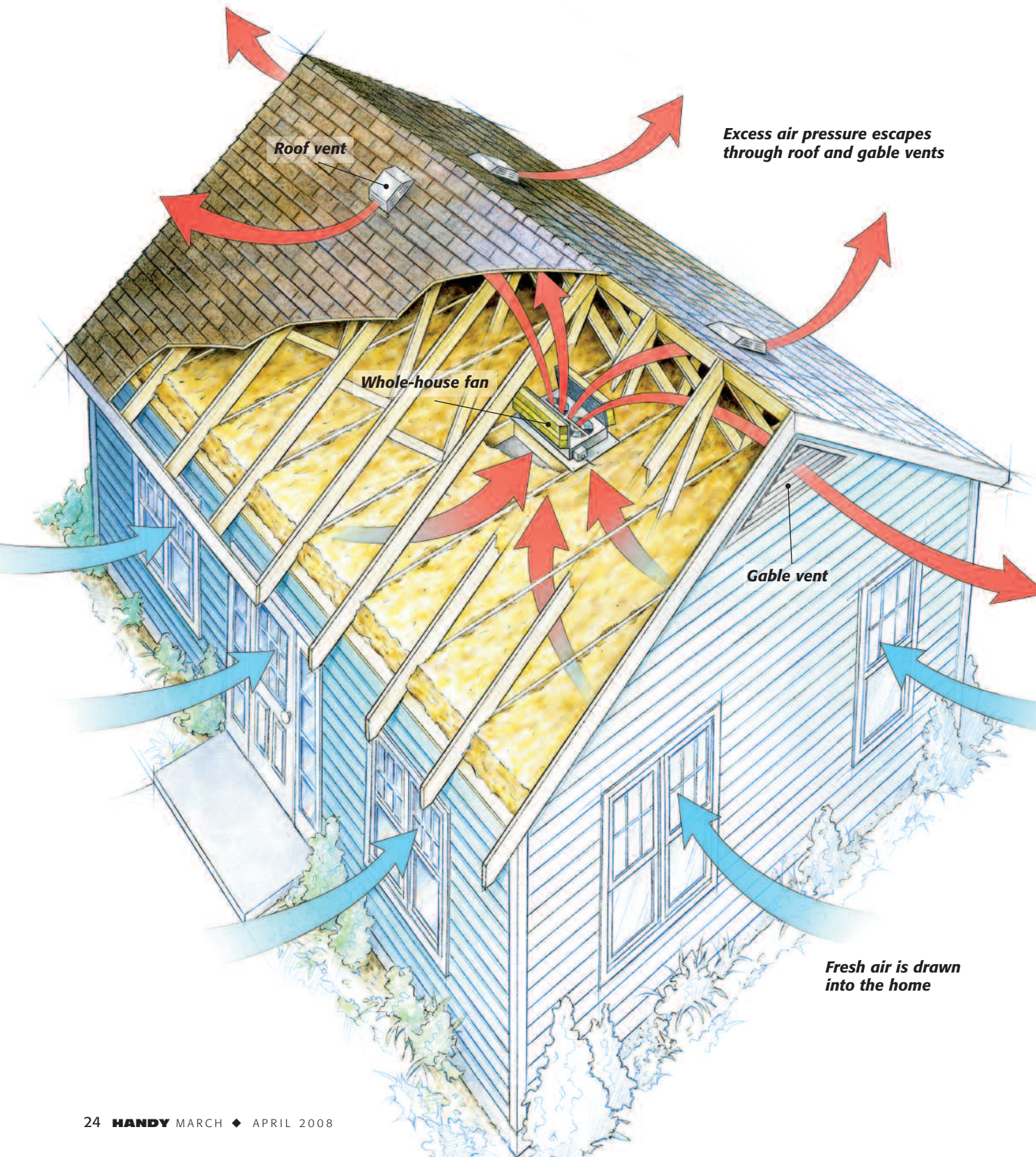
A breath of Fresh Air



Create a healthy home environment with whole-house ventilation

BY MIKE BERGER

All homes need adequate ventilation. Without it, contaminants such as formaldehyde, volatile organic compounds (VOCs) and radon can accumulate, unpleasant odors can linger and excess moisture can build up and cause health- and home-damaging mold growth.

Until recently, most homes got adequate ventilation from natural air movement through cracks and small holes (known as air infiltration) as well as vents such as windows and doors. But as the cost of heating and cooling has increased and housing technology has improved, uncontrolled ventilation has been drastically reduced. In fact, some houses may be constructed in such an airtight fashion that it's necessary to compensate by installing a whole-house ventilation system.

These systems use one or more fans and ductwork to exhaust stale air from the home and draw in fresh air. Not only do they help to reduce humidity levels and cooling bills, but they can also be effective in alleviating symptoms for allergy and asthma sufferers.

System designs

Many homes need additional airflow to replace air that is used by a clothes dryer, a water heater, a furnace, a fireplace, bathroom fans and a kitchen range hood. Though some of these (such as the furnace or water heater) often require dedicated air intakes according to building codes, additional ventilation may still be needed. There are three types of whole-house ventilation systems:

- ***Exhaust ventilation***, where a mechanical system forces inside air out of the home
- ***Supply ventilation***, where a mechanical system forces outside air into the home
- ***Balanced ventilation***, where a mechanical system forces equal quantities of air into and out of the home (See "Central Ventilation Systems," p. 26)

Exhaust-ventilation systems are relatively simple and inexpensive to install, and they typically consist of a single fan connected to a centrally located exhaust point. These systems are most applicable in cold climates because in warm environments with humid summers, the resulting drop in internal house air pressure that the exhaust fan creates can draw moist air into wall cavities, where it may condense and cause moisture damage.

Supply-ventilation systems work by using a fan to pressurize a building — as the pressure builds, excess stale air leaks out through holes in the building's shell and through the bath and range fan ducts. Like exhaust-ventilation systems, supply-ventilation systems are relatively simple and inexpensive to install, and they offer the additional benefits of discouraging the entry of pollutants from outside the living space and of avoiding backdrafting of combustion gases from fireplaces and appliances. However, during winter, supply-ventilation systems can cause warm interior air to leak through random openings in the exterior wall and ceiling, and if the interior air is humid enough, some moisture may condense in the attic or in cold outer parts of the exterior wall, where it can promote mold and mildew. As a result, these systems may not be the best choice if you live in a cold climate.

A balanced-ventilation system uses two fans and two sets of ductwork to move equal amounts of air into and out of the house. As a result, the home is neither pressurized nor depressurized. Because they require two fans, balanced systems are usually more expensive to install and operate than supply or exhaust systems, but they're better suited to a wider range of climates.

As an option, some balanced systems incorporate a heat-recovery unit into the basic design, which reduces a home's heating and cooling costs by transferring heat from the warm inside air being exhausted to the fresh, colder outside air being drawn in during the winter, and vice-versa in the summer. Balanced

Some whole-house fans, such as those from Tamarack Technologies, can be operated by remote control.

PHOTOS BY MIKE ANDERSON; ILLUSTRATION BY TECH ART & DESIGN

CENTRAL VENTILATION SYSTEMS

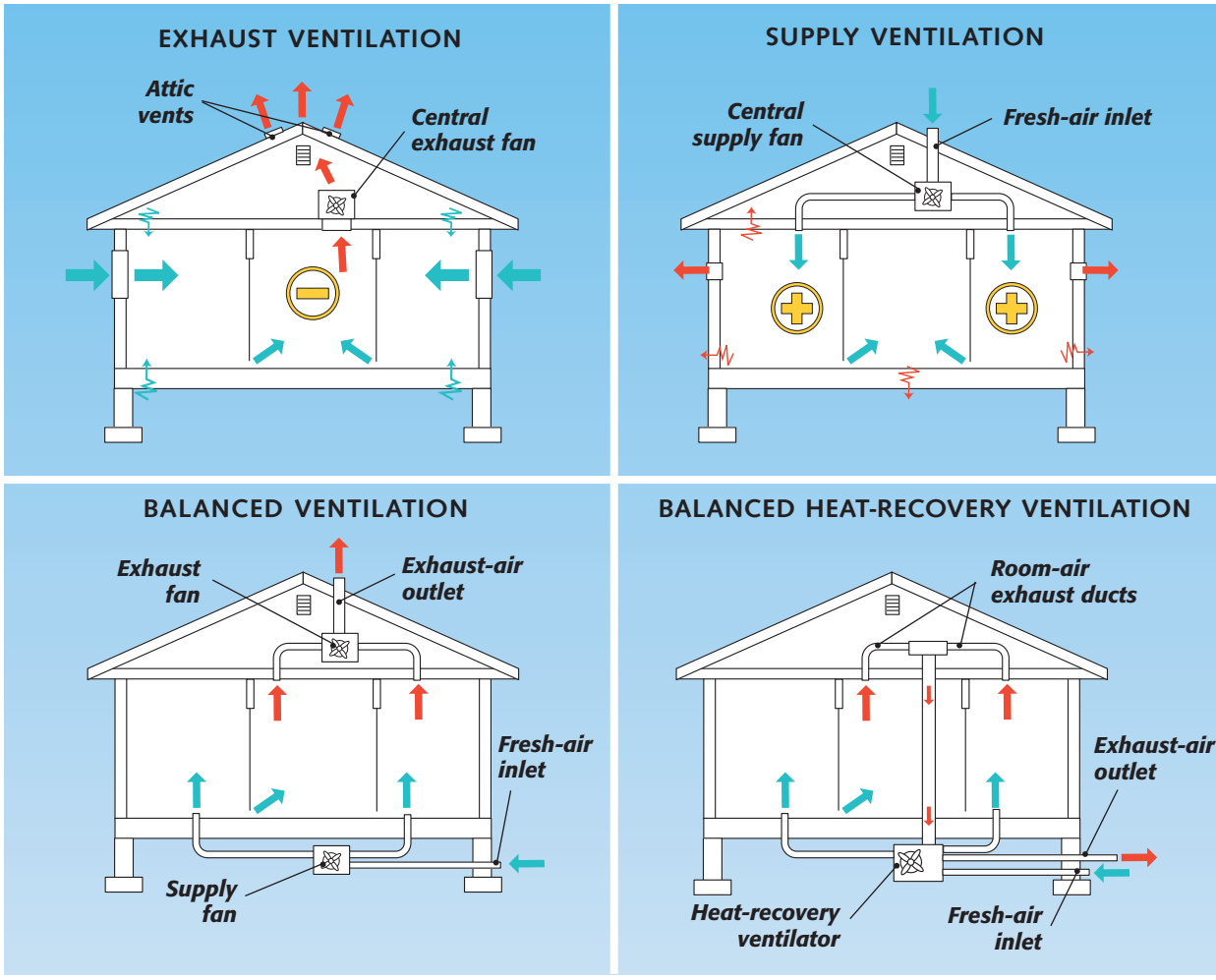


ILLUSTRATION BY MIKE ANDERSON

systems that use heat recovery are more costly to install than those without it, and although it takes more electricity to operate them, they're the most cost-effective systems in climates with extreme winters or summers and where fuel costs are high.

Typical installation

While some whole-house fans such as the one from Tamarack Technologies (see SOURCES ONLINE) are simple to install, other models may require you to make significant framing modifications. Our installation required two short lengths of 2x stock to match the existing attic framing, a saw to cut a hole in the drywall ceiling and a screw gun to attach the blocking to the existing joists.

To begin your installation, first determine where in your attic the fan will be installed. To work effectively, a whole-house fan should be located as centrally as possible, such as above a

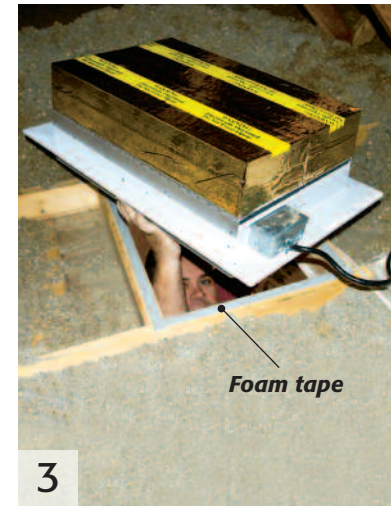
DESIGNING A SYSTEM

To get the most out of your whole-house fan system, follow these guidelines recommended by the Department of Energy:

- *Air-seal the house as much as is reasonably possible, especially the foundation, garage or other spaces from which polluted air could be drawn.*
- *Choose building materials, paints and furnishings that release minimal volatile organic compounds (VOCs).*
- *Select a general ventilation-design strategy appropriate for your climate. Consider the type of heating-and-cooling system to be installed, the operating costs of the ventilation system, the impact of the system on heating and cooling costs, the installation costs, and the desire or need for filtered air (an important consideration for people with asthma, allergies and other environmental sensitivities). Ensure that depressurization will not lead to moisture damage in wall cavities in humid climates or introduction of pollutants from outside the house and that pressurization will not lead to moisture problems in cold climates.*
- *Determine the house's ventilation requirements by consulting ASHRAE and local codes. A continuous ventilation rate of 50 to 100 cfm is typical.*
- *In developing your whole-house ventilation design, keep operating costs as low as possible. When figuring the home's ventilation requirements, consider the contribution of natural ventilation. Avoid excess ventilation, as it can increase heating and cooling costs without significantly improving air quality.*
- *Incorporate spot ventilation (such as exhaust fans in kitchens and bathrooms) into your whole-house ventilation design.*
- *Make sure all ventilation ducts are airtight and that all control systems work as intended.*
- *Consider hiring a specialist to select and design your system. — **MB***

After marking the corners, use a chalk line to mark the perimeter of the opening on the ceiling for the fan unit. A drywall saw will make quick work of cutting.

Cut additional lengths of 2x material to form a platform for the fan unit to rest upon; then screw the lengths to the existing framing.



After applying foam gasket tape to the top of the joists, set the fan unit in place. Be careful to not apply any pressure to the fan doors as you lift the unit.

main hallway or at the top of a stairwell. Use a chalk line to mark the opening's perimeter (photo 1, above); then cut the opening in the ceiling to the manufacturer's required dimensions.

Cut two pieces of 2x stock of the same dimension as the existing joists, and add these pieces of framing to form a box between the joists (photo 2). Attach foam gasket tape to the top of the joists and the added framing; then set the fan unit on the gasket with the doors facing to open into the attic (photo 3).

Wire the fan as required by the manufacturer. We were able to simply add a receptacle in the attic for the fan motor to plug into (photo 4). If you're unsure of the wiring process, don't hesitate to call a licensed electrician. Plug in the unit and check it for proper operation; then install the grille on the ceiling below the fan (photo 5).

Supply power to the fan unit following the manufacturer's requirements. In this case, we wired in a grounded receptacle.

After checking for proper operation, fasten the fan's grille to the ceiling. If desired, you can paint the grille to match the ceiling.

When operating any whole-house ventilation system, always follow the manufacturer's recommendations, such as opening a window to allow for proper airflow (if necessary). Never force the fan doors to open or close, as you may damage the door motors. And remember to disconnect the power to the unit before you attempt to clean the fan blades. ◆

DETERMINING FAN SIZE

The air in your house should be changed .35 times an hour, according to the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE), so you'll need a whole-house ventilation system that's the right size for the job. Fans are sized based on the amount of air they move, as indicated by their cubic feet per minute (cfm) rating. A simple formula to determine your required cfm is expressed by (house volume x .35) ÷ 60 = cfm. However, the experts at Tamarack Technologies point out that a smaller fan will work just fine if it's run for a longer period, and it will be significantly quieter. Don't know your home's total volume? Simply multiply the length, width and height of each individual room and then add those numbers together. — MB

SOURCES ONLINE

For online information, go to www.HandymanClub.com/FromHandy and click on SOURCES ONLINE.

EERE Information Center, 877-337-3463

Energy Efficient Building Association (952) 881-1098

Tamarack Technologies (whole-house fan units), 800-222-5932