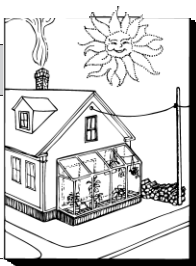


Using Heating Ducts For Ventilation

by Bruce Sullivan



Most new homes are built with forced-air heating systems. So it's no wonder that some builders use the ductwork for fresh air ventilation as well.

Besides bringing fresh air into the house, integrating ventilation into a existing forced-air system can actually correct a problem that's common to tight homes with combustion appliances. It's called backdrafting and it works like this: When a house can't get enough outside air to replace that removed by exhaust-only appliances like clothes dryers and bath fans, then the interior is put under a negative pressure. To equalize the pressure, air is pulled down the chimney and through the furnace. If the furnace happens to be turned on, this can also introduce potentially lethal carbon monoxide into the living space. Ventilation corrects the problem by correcting the pressure imbalance.

Cautions

Not everyone likes the idea of using heating ducts for ventilation. One reason is that such systems are inexpensive to install but expensive to operate. Furnace fans draw 300 to 700 watts, and when used for ventilation they need to run several hours per day regardless of whether the heat is on. To minimize costs, wire the fan so that it runs on low speed when it's

in the ventilation-only mode.

The other reason is that a poorly designed system may cause more problems than it solves. The biggest problem is leaky ductwork. Large volumes of air can leak into and out of poorly sealed ducts, negating any ventilation benefits and undermining the efficiency of the heating system. If the leaks are in a return plenum that goes through a garage or crawlspace, unwanted toxins could be introduced to the living space. The only way to avoid these problems is to place all ductwork inside the home's thermal envelope or to make sure that they're carefully sealed.

Elements of an Effective System

As the illustration shows, the concept behind the integrated system is simple. The furnace's air handler draws outside air through a fresh-air duct to the heating system's return plenum, then distributes the air through the house. At the same time, an exhaust fan removes roughly the same volume of stale air as is introduced by the air handler. Here are the basic components:

Fresh air duct. This duct runs from the outside of the house to the return plenum of the air handler. The most important issue when choosing a duct is to make sure that it permits sufficient air flow. You can minimize resistance by using a smooth metal duct (as opposed to flex-duct) at least

6 inches in diameter and no more than 10 feet long. Connect the duct as close to the blower as possible — about 2 feet from the blower is ideal.

Keep the intake away from potential sources of pollutants, including rooftops, driveways, barbecues, and pet areas. And make sure that it's at least 6 feet away from the exhaust vents for fans or the clothes dryer.

Balancing damper. This lets you balance the amount of fresh air introduced to the house with the amount of stale air that's exhausted. It's set when the system is installed, then left alone.

Electrically operated on/off damper. You'll need some way to keep fresh air out of the ductwork when it's not needed. Some people cut corners by using a barometric damper (like the simple flapper that's usually installed in the furnace's exhaust duct). This is a mistake. Barometric dampers act as a leak in the return duct, letting outside air into the system whenever the air handler operates. The resulting over-ventilation could increase heating and cooling bills.

A better solution is to use an electrically operated on/off damper. The spring-loaded device is normally closed. In response to a signal from an automatic control, such as a clock timer, the damper opens and lets fresh air into the system.

Controls. For the system to work correctly, the damper, air handler, and exhaust fan must turn on and off simultaneously. To accomplish this, some type of timed control is needed. A simple \$30 clock timer will usually do the job.

You'll also need a manual override to operate the system when the timer is off. The options are a toggle switch or a twist timer with a setting of up to one hour. I prefer a twist timer.

Exhaust fan. Exhaust fans should be quiet (rated for no more than 1.5 sones of noise) and should draw at least 80 cubic feet per minute. One option is to use a centrally located bath or laundry fan. Three manufacturers with ceiling mounted fans that meet the air flow and noise requirements are Broan (926 West State St., Hartford, WI 53027; 800/558-1711), Nutone (Madison and Red Bank Roads, Cincinnati, OH 45227; 800/543-8687), and Panasonic (1 Panasonic Way, Secaucus, NJ 07094; 201/348-7000).

A second option is a remote-mounted in-line exhaust fan. These cost between \$100 and \$200 and are centrally located in an attic, basement, or crawlspace. The fan is connected to pick-up grilles in the kitchen and bathrooms. Besides saving money on bath fans, remote fans are much quieter than ceiling mounted fans. Their main drawback is that you must ventilate the whole house when you just want to air out a bathroom.

The third alternative is to use the

kitchen range hood. Typical range hoods are too loud for general ventilation, but you can get a remote-mounted fan that's designed and UL listed for hookup to a range hood. The only fan I'm aware of that's rated for this application is the VMP-K by American Aldes (4537 Northgate Court, Sarasota, FL 34234; 800/255-7749).

Interior doors. For the system to operate properly, air coming out of the supply registers must be free to flow through the house to the return grilles. Closed doors restrict this flow, and can even block it completely. Although it won't eliminate the problem, undercutting interior doors will help. There should be a 3/4-inch to 1-inch gap between the finish floor and the bottom of the door.

Preassembled Systems

The key to getting good performance from any ventilation system is to make sure that the various pieces work together. When the clock timer or manual override gives the signal, the electric damper should open, and the air handler and the exhaust fan should switch on. Some hvac technicians cobble the necessary connections together with off-the-shelf relays and transformers. This will work if it's done right, but an easier way is to use one of three products that have the connections built in.

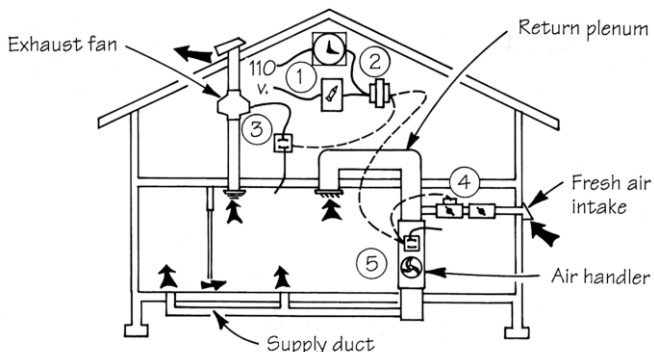
The Timed Make-Up Air Control or TMAC (Trol-a-Temp, 57 Bushes Ln., Elmwood Park, NJ 07407; 800/828-8367) is a clock timer control that provides connections for the two fans. An on/off damper is included with the kit. The TMAC is a low-voltage control, so it must be connected to an external step-down transformer that reduces 110 volts in the house circuit to 24 volts.

The other two products don't need a transformer, since they can operate on either 110 or 24 volts. The Energy Vent (Furnace Tender, P.O. Box 890714, Houston, TX 77289; 713/485-4421) is an electrically operated damper with built-in connections for the exhaust fan and blower. You need only add the timer.

The most complete system is "Air Quality Control Center" manufactured by the Duro Dyne Corp. (130 Route 110, Farmingdale, NY 11735; 800/899-3876). It includes an electric on/off damper, a clock timer, a manual override switch, and output for a 110-volt exhaust fan. The total cost is about \$120, half of what you would pay if you bought the individual components separately. A very similar new system is manufactured by Tjernlund Products (1601 9th St., White Bear Lake, MN 55110; 800/255-4208). ■

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Ventilation Through a Forced-Air System



- 1 Clock timer (110-volt) and manual twist timer
- 2 24-volt transformer
- 3 Exhaust fan relay
- 4 Electrically operated on/off damper
- 5 Air handler blower relay

— 110-volt wires
 - - - - - 24-volt wires

The furnace's air handler draws air into the system through an outdoor intake, then distributes it to the living spaces. At the same time, an exhaust fan removes stale air.