You Can Install

Running PVC and low-voltage wiring brings cleaner rooms and clearer air

BY MIKE GUERTIN

Allergies and asthma are on the rise in the United States, especially among children, and one direct cause is the indoor-air quality in our homes. According to a study by the University of California at Davis School of Medicine, using a central-vacuum system can reduce allergy sufferers' symptoms by as much as 61%. When I started focusing on building airtight, energy-efficient houses, my concerns about indoor-air quality led me to begin installing central-vacuum systems.

Lately, I've been asked to retrofit a few central-vacuum systems. Most of the work is straightforward—running PVC pipe and low-voltage wiring. The difficulty is determining the best way to run the piping without collateral damage while still getting the ports in the most convenient locations.

How central vacs beat the portables

Central vacuums don't necessarily have better filters than conventional vacuums, but they discharge exhaust outside the living space. Fine particles that make it past the filters of regular vacuums are delivered back inside the house. Today, living in a house with a central vacuum, I recognize a marked difference in the dust levels compared to previous homes that were cleaned with a portable vacuum.

A central-vacuum system offers other benefits beyond improved air quality. It is more powerful than a conventional vacuum, and because the motor and canister are in a

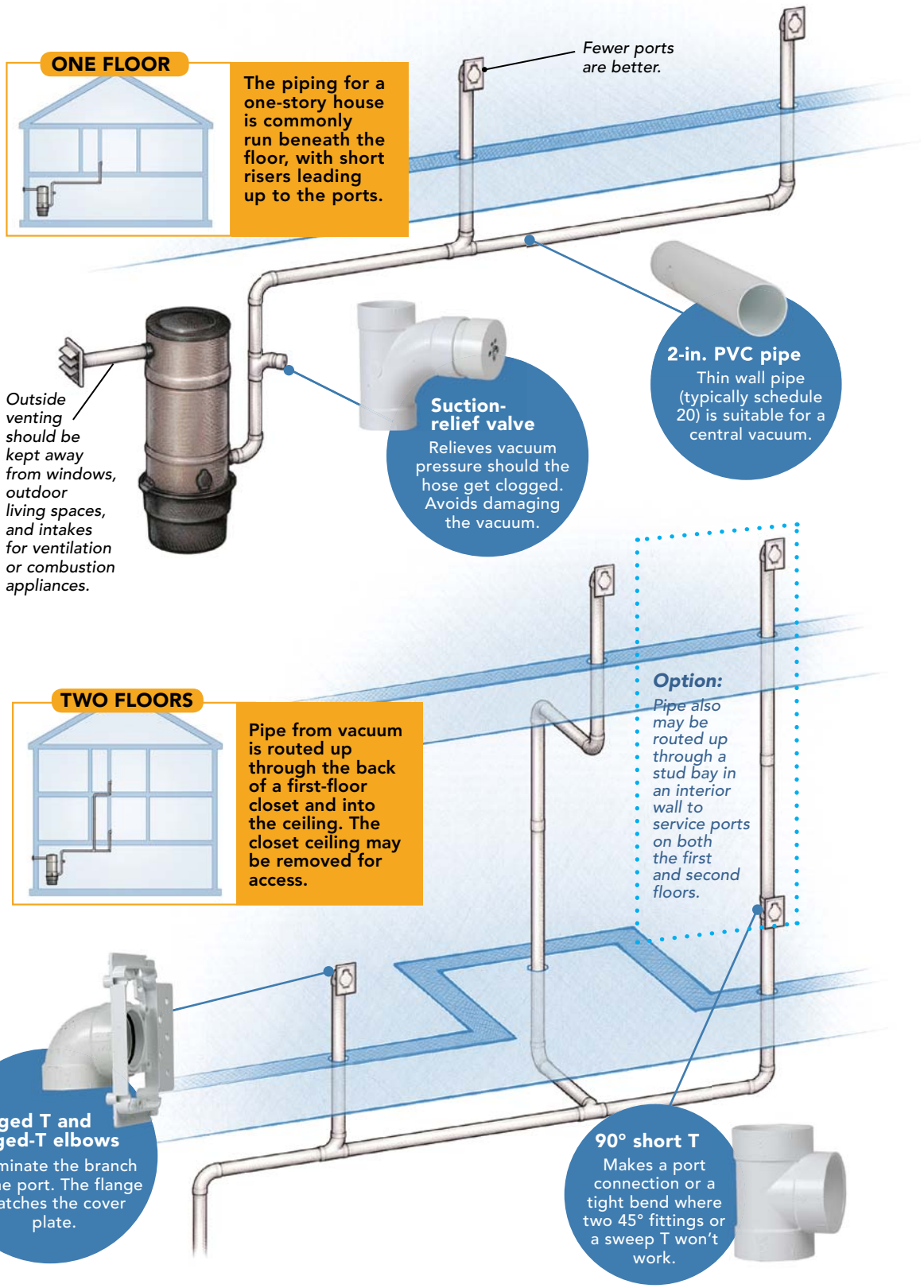
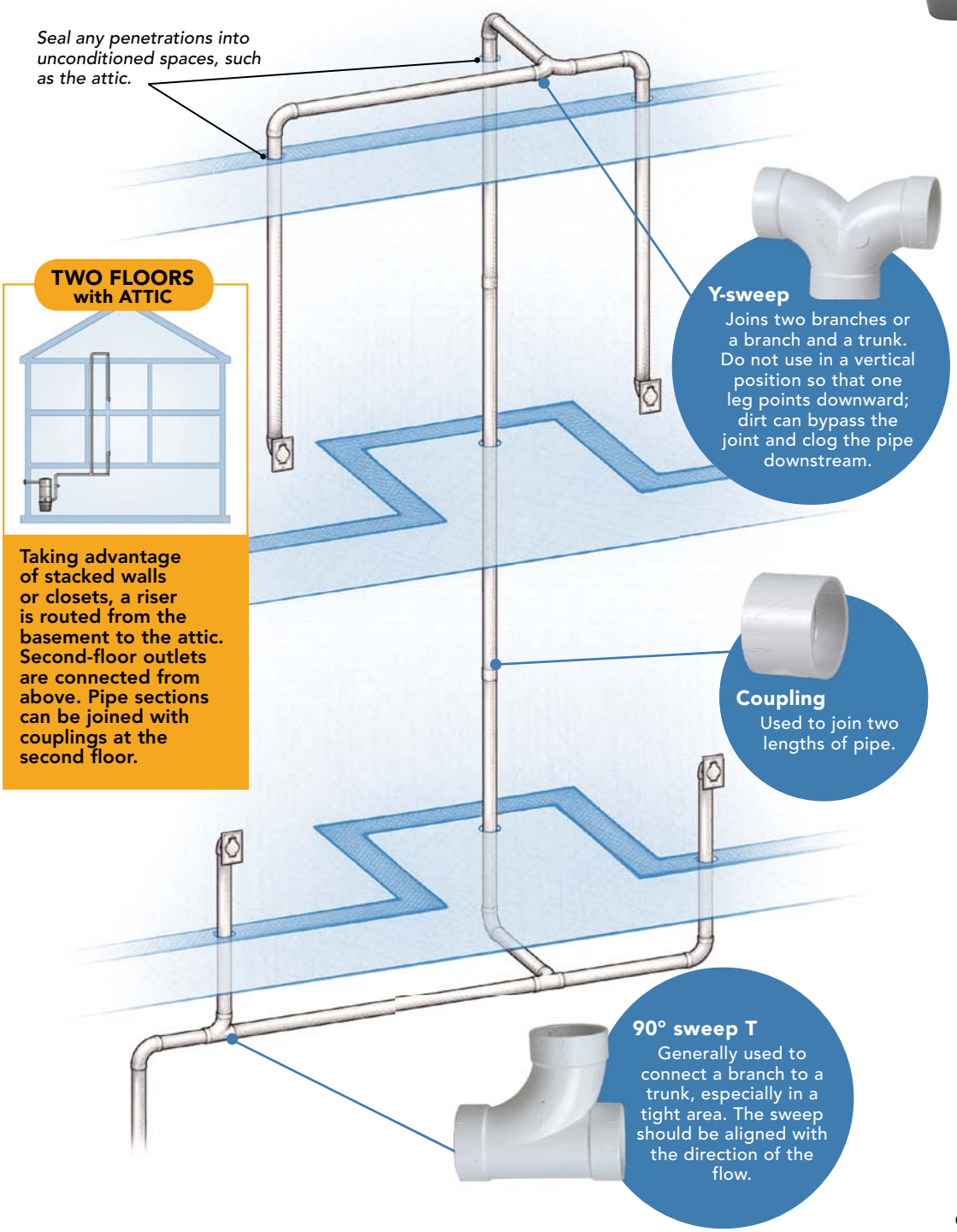


Photo facing page: courtesy of Broan-NuTone LLC. Drawings: Christopher Mills.

a Central Vac

LAY OUT AN EFFICIENT SYSTEM

The first step in planning a central-vacuum system layout is to determine the port locations. They should be based on convenience and hose length. The vacuum unit should be installed in the basement or garage, on an exterior wall if the unit is to be vented to the outside.



Canister choices

Bagged models have a bag inside the canister that filters out the dirt, much like many portable vacuums.

Pros: The bag sufficiently filters fine particles so that the air can be discharged inside the house. An exterior exhaust reduces noise and the amount of fine dust circulating back into the house. Removing the bag is a relatively clean process.

Cons: The system suction diminishes as the bag fills with dirt. Changing the bag when it's 75% to 80% full helps to maintain performance and minimizes motor wear, but the bags add to the operating expense.

Filtered models have a conical baffle that causes most of the dirt to drop out of the airstream before passing through reusable filters that catch the finer particles.

Pros: Filtered central vacuums don't need to be exhausted to the exterior, but doing so reduces noise.

Cons: Suction diminishes as the filter clogs with fine dust particles. The filter may need to be cleaned before the canister fills with dirt. Emptying the canister is the same as for cyclonic models.

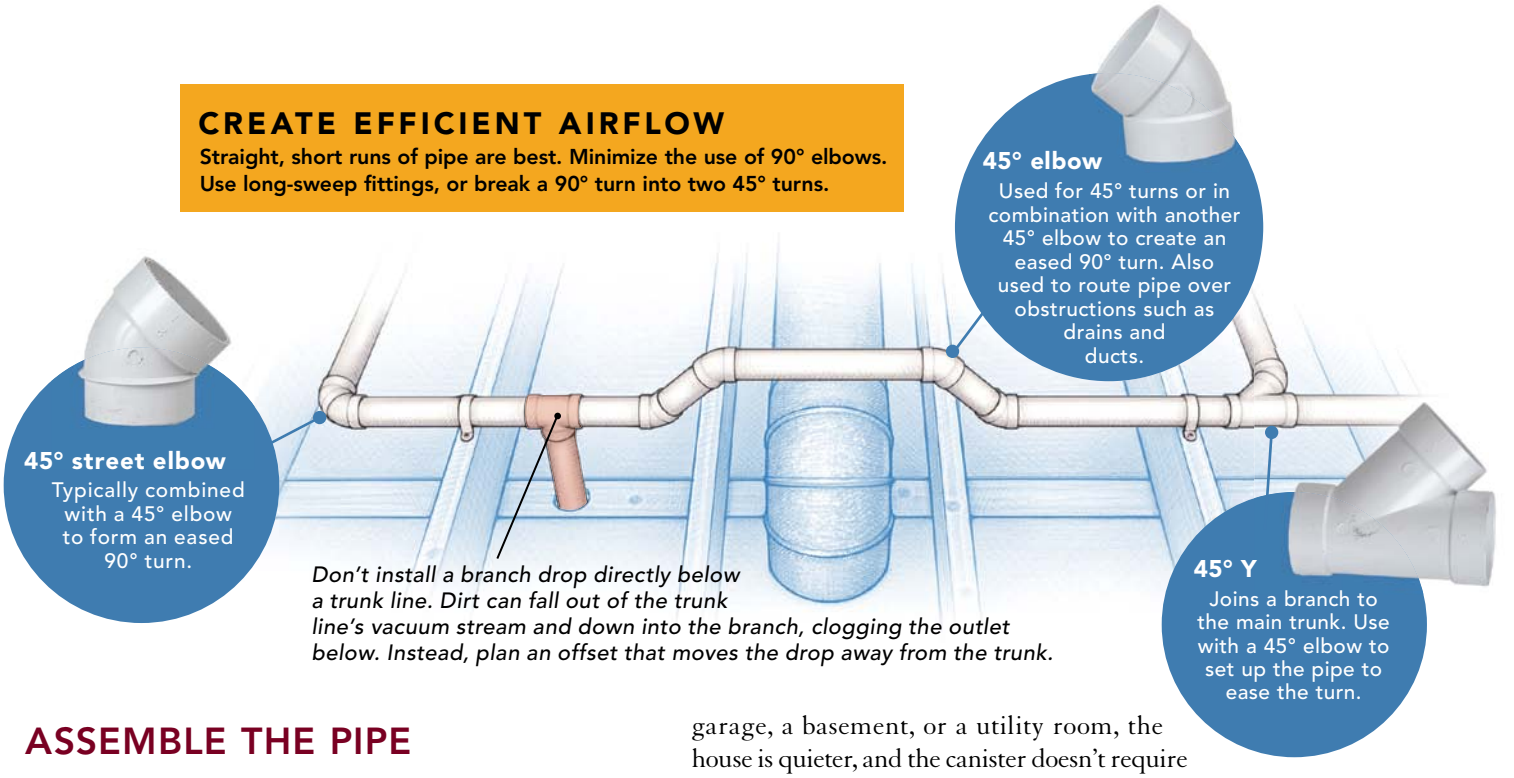
Cyclonic (or bagless) models spin the air within the canister so that dirt drops to the bottom of the canister.

Pros: No filter or bag means better performance and reduced motor wear.

Cons: No filter or bag also means the vacuum exhaust contains some dust and must be discharged outside. Emptying the canister is also best done outside.

CREATE EFFICIENT AIRFLOW

Straight, short runs of pipe are best. Minimize the use of 90° elbows. Use long-sweep fittings, or break a 90° turn into two 45° turns.



Don't install a branch drop directly below a trunk line. Dirt can fall out of the trunk line's vacuum stream and down into the branch, clogging the outlet below. Instead, plan an offset that moves the drop away from the trunk.

ASSEMBLE THE PIPE

If possible, hold the pipe in place to mark the length. PVC pipe can be cut with a miter saw or a handsaw, but if you'll be cutting a lot of PVC, a special PVC saw may be worth the investment. Be sure to cut the pipe square to ease assembly of fittings and to provide plenty of bonding surface. Smooth the cut edges with sandpaper for an easier fit. Apply a thin coat of PVC cement to both halves of the joint, and press the pieces together.

garage, a basement, or a utility room, the house is quieter, and the canister doesn't require emptying as often. I empty ours maybe twice a year. In as little as five minutes, I dump out the dirt, brush off the foam filter, and snap the canister back together.

While most general contractors and homeowners hire specialists, installing central-vacuum systems isn't hard work. I can usually rough in a new house in a couple of hours or retrofit an existing house in half a day with minimal tools or mess. It's easy, and the parts are inexpensive. The vacuums themselves can get pricey, but they tend to last longer and perform better than portable vacuums. The key to an easy installation and a system that performs well is thoughtful planning.

Planning starts with port locations

Good central-vacuum layout takes into account the location of the vacuum canister, the hose-port locations, and the piping routes between the ports and the vacuum. Vacuums can be noisy, so it's a good idea to locate the canister away from living areas. A utility room, laundry room, garage, or basement is a natural candidate. The location must be easy to access for filter cleaning and bag replacement. Ideally, the vacuum will be exhausted outside, so there should be an easy route to the exterior. The exhaust should be kept away from windows, outdoor living spaces, and air intakes for ventilation and combustion appliances.

Vacuum ports need to be spaced so that the vacuum hose can reach the far corners of every room of the house. While you could install a port in every room for convenience, fewer ports mean less air leakage and more efficient cleaning, not to mention labor savings.

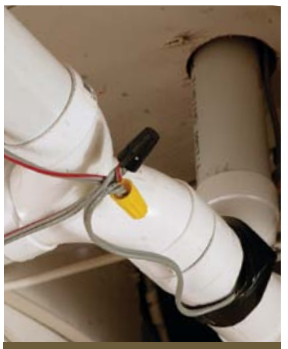
Although hoses are 30 ft. to 35 ft. long, that doesn't mean you can install one port in a 60-ft.-long house. I use a 30-ft. length of rope to mimic the range of a hose to see how much space one centrally located port can service. If one port cannot accommodate an entire floor, I try a layout with two ports. It's rare that a house needs more than two ports on a floor. The ports must be accessible. Hallway walls or wall sections just inside a room beneath a light switch are good locations because they're unlikely to be blocked by furniture.

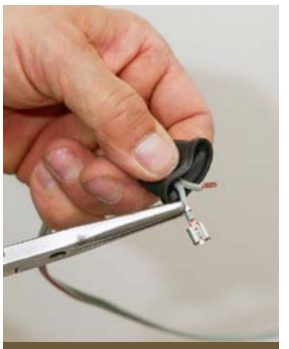
Installing central-vacuum piping in the open stud walls and joist bays of new construction is a simple process, but adding a system to

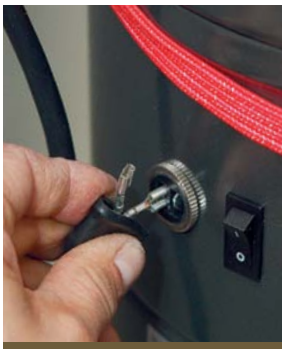
Photos facing page: top, Charles Bickford; bottom inset, courtesy of M.D. Manufacturing Inc.

MAKE THE WIRING CONNECTIONS


Start at the mounting plate.


Make junctions at PVC joints.


Attach friction terminals.


Connect the vacuum.


Connect the ports.


Attach the cover.

It's best to run the low-voltage wire at the same time as the pipe. Leave extra length at the port location, and run each wire back toward the vacuum unit so that it can be connected with wire nuts at a common junction of fittings. The circuit is a simple loop, so polarity isn't important. Use electrician's tape to keep the wires neat. At the vacuum, crimp friction terminals onto the leads, and plug them into the vacuum. At the port, strip back about ½ in. of the wire's insulation, wrap each lead clockwise around its terminal, and tighten the screw. Finally, screw the port onto the mounting plate.

an existing home can be a challenge. I explore alternative locations for the vacuum and ports in existing homes to see which combination keeps the piping layout simple to install. I also pay close attention to the location of light switches and receptacles near a proposed vacuum-port location. It's a good idea to locate the ports next to outlets for vacuum heads that require power. I try to avoid stud bays that are filled with a huge number of wires. I'll even cut a hole in the drywall at the same height as nearby electrical receptacles to take a look before committing to a layout.

Options for running pipes

Thin-walled 20-ga. PVC is the norm for central-vacuum piping, and the systems are laid out much like trunk-and-branch plumbing systems. In most single-story homes, the trunk line runs beneath the floor system, with branch lines rising through the bottom plate of interior walls to reach the ports. The attic also can be used to route trunk lines, with the branch lines descending through the top plate to reach the ports. Many two-story homes use both strategies.

Layout gets tricky when trying to determine the best way to snake pipes around an existing home while doing the least collateral damage to drywall or plaster. I can usually bore holes from below to run trunk lines to first-floor ports without cutting openings in the wall larger than I need to install the ports. Getting to the second floor is a bit more difficult. Stacking the ports may allow me to get away without running an attic trunk line, but it requires that I cut an opening in the drywall at the top of the first-floor wall or bottom of the second-floor wall. If I am forced to use the attic for a trunk line in an existing house, I look for a chase or closet to route a riser through. I may even run metal pipe up a chimney chase or box the pipe into the corner of a room. My last choice is to snake the pipe up through a stacked wall, which is tricky and requires a lot of drywall repair. □

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How many air watts do you need?

In addition to filtration, vacuums are classified by power that's expressed as air watts, which is determined by multiplying the airflow (in cubic meters per second) by the suction (in pascals). The higher the air wattage, the more vacuum power the unit will generate. Air-watt performance pretty much parallels cost: More money gets you higher air wattage. The three types of collection units range from about $300 for 400 air watts to about $1000 for a paint-peeling 1300 air watts.

Of course, the tested performance is only part of the equation. Convoluted layouts with numerous ports, tight bends, and port gaskets that leak can quickly diminish a system's overall performance. Manufacturers or retailers typically recommend a minimum air-watt rating for houses of a particular size, but they often advocate supersizing a system to improve performance. Unless the system is complex, though, the minimum ratings are usually adequate. I chose a unit with 453 air watts and bag collection for my 1600-sq.-ft. house, and it works just fine.