Central Dust Collection

Five Simple Rules for a Dust-Free Shop

Small, one-person shops don't need complicated dust-collection systems. We'll show you how to get powerful collection at the lowest possible price without ever having to use a calculator. Even if your shop is shoehorned into a corner of your basement or garage, you can still enjoy the benefits of central dust collection. We turned to the experts at Oneida Air Systems (see Sources, page 101) for both the design and materials for our fully featured, small-shop dust-collection system. Our shop fits in one stall of a two-car garage, where the machines have to be moved against the walls to accommodate a car (rats!) (photo below, right).

Cost

The total cost for our system (excluding the dust collector) was about $800. Expect to spend about a day putting in the system. I know what you're thinking, "Wow, I can't afford that!" But, don't forget, we built a deluxe system with floor sweeps and ductwork running to each machine (Fig. A, page 58). You could cut the cost of our system in half simply by doing what I do in my shop at home: sharing. It takes about five seconds to pull the flex hose off one machine and hook it up to another. For example, the 4-in. flex hose to the tablesaw (Fig. A) could easily be shared with the bandsaw and the lathe. That would eliminate the run to the bandsaw, plus a bunch of expensive flex-hose, blast gates and fittings. In addition, we could have stopped the wall run at the chop saw instead of going all the way to the workbench.

Small Shop Systems Are Simpler Than You Think

Designing a central dust-collection system for a small shop is really straightforward. Complex calculations involving cubic feet per minute, air velocity and static pressure are important for large industrial systems with long runs to big machines all running at the same time. A small, one-person shop is much simpler. The runs are short (our longest run was about 25 ft.) and only one machine runs at a time. The amount of air needed for good dust collection is relatively small. A system needs to pull about 500 cubic feet per minute (cfm) at the farthest machine to offer effective dust collection. A typical 1-1/2- or 2-hp dust collector with a 5- or 6-in. inlet and a 12-in. impeller is capable of delivering enough air in a small system to collect from tools like a 10-in. tablesaw, a 15-in. planer, a 16-in. bandsaw or an 8-in. jointer.

You *can* have a central dust-collection system! Just because your shop is small it doesn't mean a central system isn't practical. We built our system in a single stall of a double garage. The ductwork goes along the wall and ceiling and all the tools are on mobile bases.

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By Dave Munkittrick

Five Design Rules

A well-designed central dust-collection system is built like a freeway. The road has to be wide enough to handle a large volume of traffic (5-in. ductwork to all machines). Turns need to be gentle so traffic can move at a high speed without crashing (large-radius elbows). Intersections should use entrance ramps that allow traffic to gently merge (45-degree wyes for drops and branches).

Too often people build their dust-collection systems like back-country roads with narrow lanes and abrupt, 90-degree turns. They accept inferior results because they've never known what their dust collector is capable of delivering with a well-designed system.

Rule #1
Use 5-in. pipe

Using undersized ducts and fittings is the number one mistake people make. For a dust collector, it's like trying to drink a malt with a cocktail straw. Undersized ductwork restricts the cfm performance of your dust collector. Stick with 5-in. ductwork for small systems. Running 5-in. ductwork to all the machines maximizes the cfm performance of even a small central system.

Rule #2
Keep it straight

Minimize the number of bends. Each 90-degree turn creates as much resistance to airflow as 9 ft. of 5-in. straight pipe.

Rule #3

Use fittings designed for dust collection

Heating and air conditioning

Dust collection

Dust-collection fittings are designed to efficiently carry dust-laden air at about 40 mph. Just like a car, air moving at high speed can't take sharp turns without running into trouble. The large-radius elbow is more than three times as efficient as the sharp turn found on the HVAC elbow. Which turn would you rather make at 40 mph? HVAC fittings are designed to carry air at a slow speed. Their sharp turns and 90-degree intersections create a ton of drag in a dust-collection system.

Rule #4

Change the dust fittings on your tools

Manufacturers sometimes put a dust port where it fits best, not where it works best. More often than not, the ports are undersized as well. A few simple alterations can make a huge difference in how much dust gets left behind on hard-to-collect-from tools such as bandsaws. Use 4-in. ports wherever possible; 5 in. is even better.

Rule #5

You don't need a big dust collector

People agonize over this selection but it's really not that tough. For your basic shop under 1,000 sq. ft., where only one machine will be on at a time, a 1-1/2- to 2-hp collector with a 5-in. or 6-in. inlet and a 12-in. fanwheel will do the job. Check out our Tool Test on Dust Collectors (AW #80, June 2000, page 80). You can't go wrong with our Editors' Choice, the Oneida 1-1/2- or 2-hp cyclone collector.

Installation

A central dust-collection system is built like a freeway with wide lanes, entrance ramps and gentle turns.

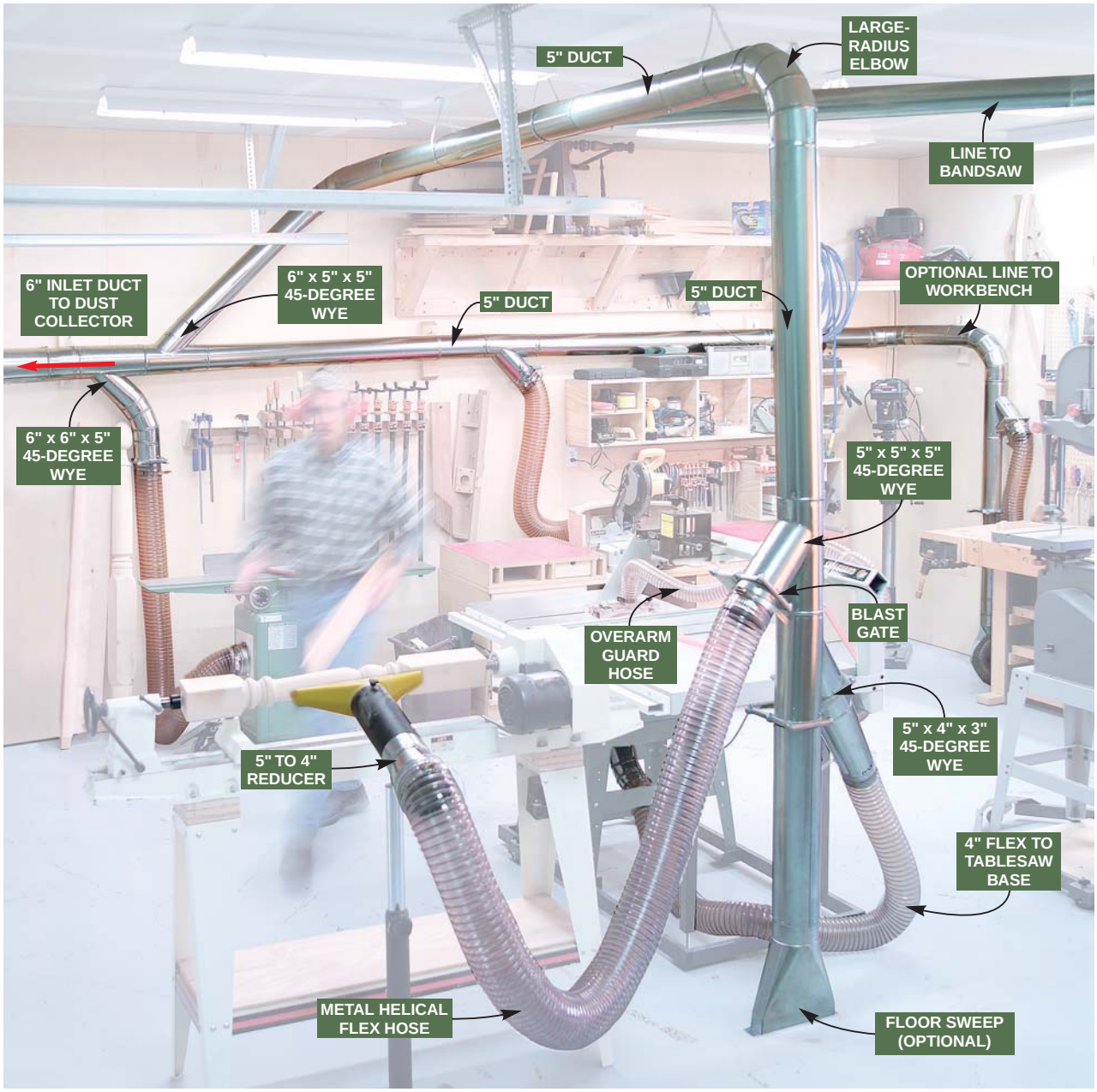


Fig. A Anatomy of a Central Dust-Collection System for a Small Shop

Because there are as many shops as there are woodworkers, each system will be unique. At the same time, all small-shop systems have certain elements in common.

Our system starts out with 6-in. duct running from the dust-collector inlet. At the second branch, the line steps down to 5 in. for the rest of the system. 45-degree wyes are used for the line branches to each tool. Large-radius elbows create direction changes. Blast gates turn the suction on and off at each machine. Flex hose allows mobile machines to be moved without having to disconnect from the system. Reducers are used to step down the 5-in. duct to fit 4-in. ports at the machines. We included a floor sweep for all those wood shavings from the lathe, but we don't recommend using a floor sweep with single-stage collectors. Ingested metal can damage the impeller blades.

Even if you've never dealt with ductwork before, you won't have any trouble putting up your system. Be sure to wear leather gloves when handling sheet-metal parts. The metal edges can be razor sharp.

Specialty Tools and Hardware

There are a couple of specialized tools you'll want for this job (Photo 1).

The only power tools you'll need are a drill for fastening the sections and a jigsaw for cutting the pipe to length. If you don't own a jigsaw, a reciprocating saw or a pair of tin snips will do the trick.

Start at the Collector

Most 1-1/2- to 2-hp collectors have 5-in. inlets. It's best to run 5-in.-dia. pipe all the way to the tool, and use a reducer to step down to a 4-in. port, if necessary.

If your collector has a 6-in. inlet, start with a 6-in. line. After the first branch, step down to 5 in. and stick with that diameter until you get to the machines. A common mistake is to run 6 in. everywhere. Just because a 1-1/2- or 2-hp collector has a 6-in. inlet, doesn't mean it has the power to run a central system made entirely with 6-in. pipe. Also, most small shop tools have 4-in. ports. When the airflow from a 4-in. port hits the 6-in. duct, the air speed is almost cut in half. The slow air speed can result in dust settling out in your duct.

If your shop is larger than 500 sq. ft. or you have a large machine like an 18-in. planer or a 24-in. drum sander, play it safe and buy a 2-hp collector with a 6-in. or larger inlet. Big tools like an 18-in. planer or a 24-in. drum sander will max out a small system. Locate big-draw tools as close to the dust collector as possible and run 6-in. duct right to the tool.

Assemble and Hang the Ductwork

The straight pipe we used has to be assembled, but it's no big deal. It takes a matter of seconds to snap together a section of pipe (Photo 2). Run the pipe with the crimped end pointing downstream toward the collector. We recommend mounting blocks and metal hanger strap to secure the duct to the wall (Photo 3).

A few specialized tools and hardware are needed for installing metal ductwork. A hand crimper is a must-have. It'll set you back about $30, but when you need one, nothing else will do.

#8-1/2-in., self-tapping hex-head sheet metal screws and a nut-driver make attaching the pipe sections a breeze.

Metal hanger strap is the least-expensive way to hang duct from your walls or ceiling.

See Sources, page 101 for buying information.

A little downward pressure is the key to snapping together straight pipe. Start at the crimped end and slip the male edge into the female edge. Apply downward pressure on the seam as you move along the length of the pipe. Don't worry if the seam doesn't lock at first, somewhere beyond the halfway point the whole pipe will "snap" together.

Installation

Plastic or Metal?

We strongly recommend metal ductwork. It's clearly superior to PVC or plastic because:

1. Only metal pipe comes in 5-in. dia., the ideal size for small-shop systems.
2. Metal systems are much easier to disassemble and change as your shop evolves.
3. Static electric build-up in PVC and plastic ductwork can be a problem. We've all experienced the jolt a shop-vacuum hose can give. Imagine what a dust-collection system can do. Plus, all commercial codes require metal pipe for wood-dust collection.
4. The metal ductwork we used is only about 20-percent more expensive than PVC in sizes over 4 in.

This 26-gauge metal ductwork is designed specifically for dust collection.

PVC plastic is designed to carry water.

Install the pipe on the wall with metal hanger strap attached to a 2x4 mounting block. Space the blocks every 4 to 5 ft. The blocks keep the pipe out from the wall a bit so it's a lot easier to fit and hang each section. Secure the pipe to the blocks by driving a #8 x 1-1/2-in. screw through a loop of metal hanger strap.

Secure joints with #8-1/2 in. self-drilling, hex-head screws. A nut-driver and a cordless drill make quick work of fastening pipe sections without predrilling.

Suspend pipe from the ceiling with metal hanger strap. Cut the strap extra long, and have a helper hold the pipe level. Adjust the length of your loop and secure with a long screw into the rafters.

To join the pipe and fittings we found self-drilling sheet metal screws to be just the ticket (Photo 4). Don't worry about the screw ends protruding into the pipe, they're too small to matter. Use metal hanger strap every 3 to 4 ft. to suspend the ductwork from the ceiling (Photo 5).

45-Degree Wyes

Use 45-degree wyes to create drops to each machine and to start branch lines (Fig. A). These are the "entrance ramps" to your dust-collection freeway. They allow the air stream to change directions without abrupt turns.

Cutting the Pipe

Cutting pipe with a jigsaw makes one heck of a racket. Don't be surprised if the noise attracts curious neighbors and family members. (It's the perfect opportunity to ask for a little help putting up that ceiling run.) We found a jigsaw with a metal-cutting blade gave the best results with the least hassle (Photo 6).

Elbows

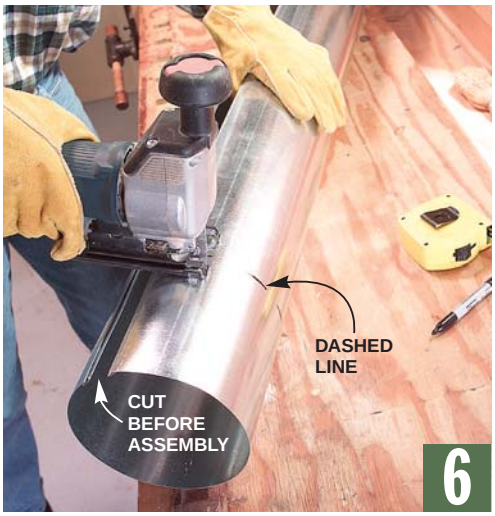
Use adjustable, large-radius elbows to make those gentle turns. They cost less than fixed elbows ($10 vs. $17) and because they're adjustable, there's no need to special order 45- or 30-degree elbows. The first time I tried to change a 90-degree into a 45-degree elbow, I ended up with a mess. The key is to turn each section 90 degrees and alternate the direction each section is turned to produce a smooth 45-degree elbow (Photo 7). To get a 30-degree sweep, turn each section 120 degrees instead of 90 degrees.

Tip: Loosen the joints by gently tapping the ends of the elbow on a flat surface.

Blast Gates and Flex Hose

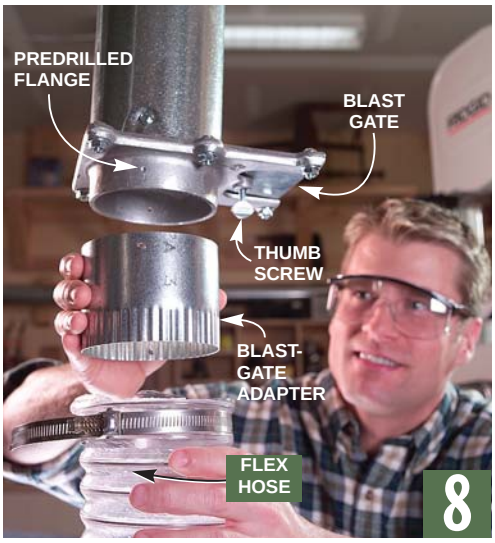
At the point where a line branches off to serve a single machine (usually at a 45-degree wye) we added a blast gate, blast-gate adapter and flex hose (Photo 8). Attach the flex hose with adjustable hose clamps. Flex hose is expensive ($5 per ft. for 5-in. dia.) so keep it as short as possible. If you know your machine isn't going anywhere, run rigid pipe right to the tool.

We recommend using flex hose with an



Cut pipe to length with a jigsaw and a metal-cutting blade. If you're using snap-lock pipe, do the cutting before the pipe is put together. Use a felt-tip pen to mark the pipe with a series of dashes. Cutting the pipe makes a racket, so be sure to wear hearing protection.

A few quick twists will turn a 90-degree elbow into a 45-degree elbow. Mark each seam along the spine of the elbow. Turn the first section about 90 degrees while a helper holds the other sections still. Then, turn the first *and* second sections together, 90 degrees in the *opposite* direction. Continue until each section has been turned.



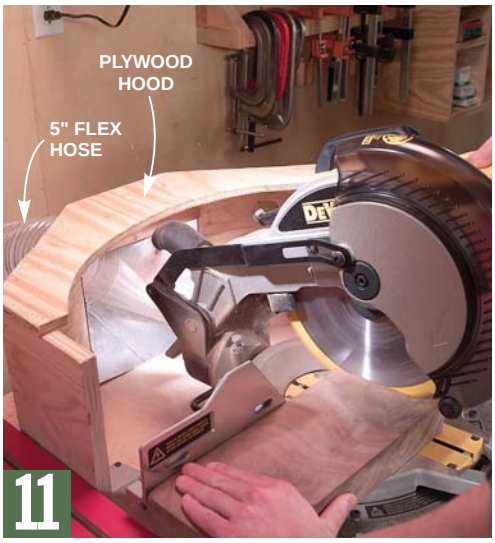
Blast gates act like an on/off switch to control the airflow to each machine. Install your blast gate so the thumbscrew tightens the plate toward the dust collector. Blast-gate adapters add length to the stubby flange on the blast gate for easier attachment of the flex hose. Note: you must predrill through the cast-aluminum blast gate.

Installation

Use a hand crimper for the occasional situation where the pipe needs a crimped end. For example, to make your own blast-gate adapters (see Photo 8).

Seal all the joints with silicone caulk. Adjustable elbows, blast gates and pipe joints all leak air. That many joints leaking a little air adds up to a big cfm loss in your line. Note: It is not necessary to seal the snap-lock seams along the length of the duct.

Some tools require custom-made dust ports. For our miter saw, for example, we built a simple plywood hood, with a large 5-in. port at the back. The powerful airflow from a well-designed central system makes this possible. Almost nothing escapes this dust trap.



imbedded metal coil and keeping the lengths under 5 ft. The metal coil and short length will keep electrostatic discharge to a minimum. To completely ground the system, just peel back the plastic to expose the wire at each end. Bend the exposed wire into a loop and screw it to the metal pipe on one end and the machine's dust port on the other.

Seal all the joints with silicone (Photo 10). If your pipe seems a bit oily, clean the joints with a little vinegar first.

Modifying the Dust Ports on Your Machines

You'll find most of the dust ports on your machines require some modification. For example, in our shop, we swapped out the 4-in. plastic port on our jointer with a 5-in. flange bolted to a piece of plywood. We also added a 4-in. dust port to the bandsaw and made a hood for the chop saw (Photo 11).

We split the 5-in. duct to the tablesaw with a 5 in. x 4 in. x 3 in. 45-degree wye joint and a 3- to 2-in. reducer. A 4-in. hose collects from the open area at the base of the saw while a 2-in. hose collects off of the overarm guard (Fig. A). The overarm guard makes a huge difference. It literally captures and whisks away all that stuff that gets thrown back at you from the saw blade.

Machines with a 4-in. dust port require a reducer fitting (Fig. A). Place a reducer as close to the machine as possible to ensure maximum cfm to the machine.

Once everything's attached, you'll be free at last from the tyranny of the broom and dust mask! No more dust tracked all over the house either. One last tip—get a remote control like the "Long Ranger" ($60, see Sources, page 101) for the dust collector. With your new dust-collection system and a remote, woodworking's never been so good. AW

We'd like to thank Jeff Hill from Oneida Air Systems for consulting on the technical aspects of the story, as well as his help in designing and installing our system.

Sources See page 101