

Setting Up Shop

There are some tools and machines that are necessary to complete even the most basic woodworking projects, and lots that are optional and can be added as your skills grow. There are also some issues about setting up shop that concern the physical space, such as workflow, wiring and dust control.

Let's begin with some housekeeping habits.

It's a really good idea to force yourself to clean up at the end of every woodshop session. Some people just walk away, thinking they will clean up first thing in the morning, but in reality the addiction is too strong: they will walk into the shop and immediately want to build. A clean shop is a safer shop. It's also more efficient, because everything is in its place so you can find it. We are creatures of habit, and we can train ourselves to have either good or bad habits.

Many woodworkers keep every little bit of leftover wood, thinking it will come in handy some day. Their widows have a heck of a time getting rid of these hoarded piles of firewood. Long scraps are a lot more useful than short ones. In our shop, if it's shorter than two feet, it is used to make gifts or is delivered to the local campground for



kindling. If it's more than two feet long and an inch or more in width, it can be edge-glued to similar boards to make usable wider ones, or glued to contrasting species to make cheeseboards and other holiday gifts such as the magic wine bottle holder shown at left. (Yup, it stands up all by itself.) We make pens and wine bottle stoppers out

of scrap, too, if the species is somewhat expensive or rare. It's important to make these items on a regular schedule, rather than hoarding piles of scrap wood for years.

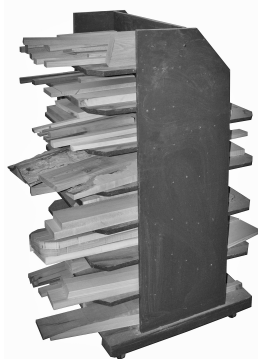
Many hobbyists don't have a separate shop building, so they have to make do with a room in the basement, or use a garage bay. The basement option has one very big drawback – dust will wander through the house, especially if you have forced air heating or air conditioning. If that's your only option, pay special attention to the section on dust control below. Basements can also be difficult when it's time to move materials in, or take completed projects out.

I knew a woodworker in Minnesota who built a cedar strip canoe in his basement – and it's still there twenty years later, because the boat is a foot too long to navigate the stairs. What's really mind-boggling is that the guy is an engineer.

If you're setting up as a professional and renting space, be sure to install everything in a way that it can be easily removed in case you outgrow the space. For example, hang the light fixtures instead of recessing them, and use on-the-wall wiring. If you're building walls and you'll have to remove them when you leave, don't mud and tape the wall-to-ceiling joints: just cover them with molding.

Racks

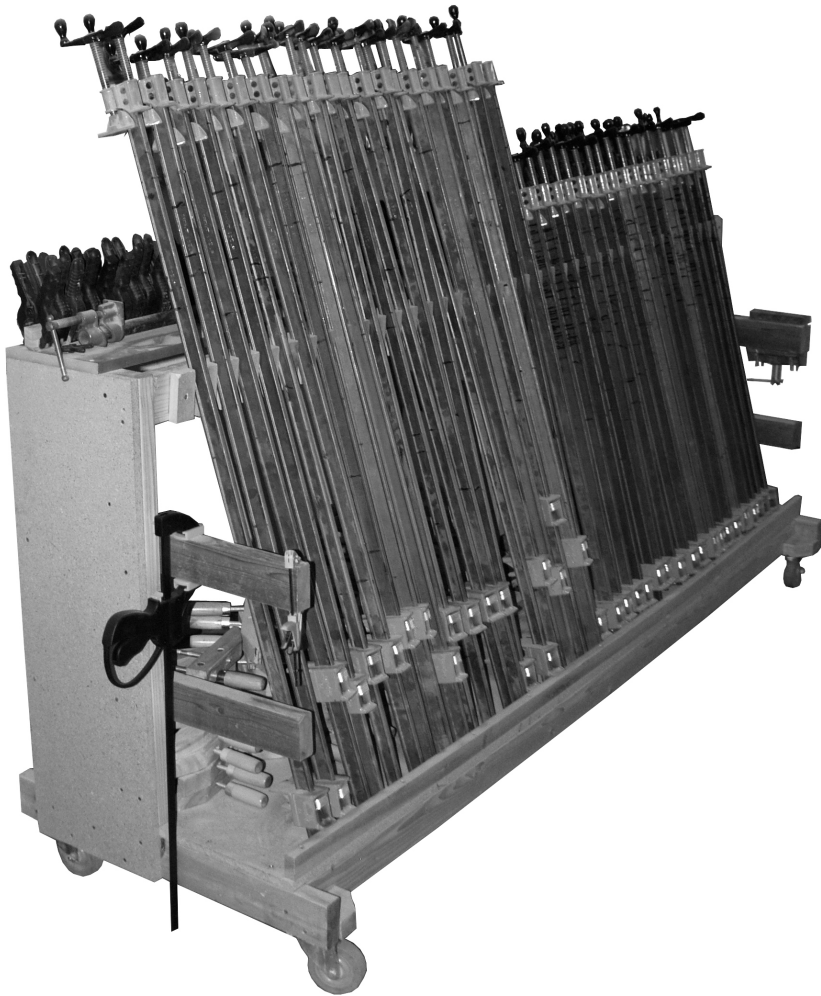
When you're planning the way that materials and projects will work their way through the shop, keep the wood rack near the entry door. Cutting and milling operations (jointer, planer, table saw and router or shaper) come next. After that is joinery and assembly (the workbench, hand tools and clamps). Sanding and finishing are the last operations, and it takes a little planning to make sure that one doesn't contaminate the other.



A wood storage rack is as essential as a table saw. In our shop, we put racks on casters. The larger one above has space at the back for partial and whole sheets of plywood and other sheet stock, a bin at the front for short lengths, and a shelf in between for long boards. The one at left is for shorts – boards that will eventually become gift items.

If you Google™ the words 'mobile wood storage rack' and then click on Images, you'll get some great ideas for building your own. Be sure to use the largest casters or swivel wheels you can find, as the racks can get quite heavy.

Having everything on a moving rack makes a confined workspace a lot more manageable.



Speaking of racks, it's a good idea to build one for your clamps, too. It keeps them all organized and saves a lot of footsteps when assembling a large cabinet or a complicated piece of furniture. Our rack, shown above, is 8 feet long, holds about forty bar clamps on the front, a hundred spring clamps on the back (top), and sixty wooden hand screws below.

A bar clamp is a huge step up from the old pipe clamps. Instead of a mildly flexible round bar, they work off a rigid steel I-beam. They don't tip over in the middle of a glue-up, and boards lie flat on them.

Apply blue masking tape to the bar before glue-up, and you'll rarely have to clean up squeeze-out (excess glue).

A few years ago, we purchased a shelving unit that has five chromed wire shelves. It came with plastic liners for the shelves, and these found their way to the shop where they are used under glue-ups to catch the drips. Wait a day and the little buttons of dried glue can be popped right off the shelf liners with an old chisel. This has saved the workbenches from glue residue for several years now, and the liners show no signs of wearing out. Many hard plastic or linoleum surfaces work, too.

Floor Plans

In the summer of 2015, *Fine Woodworking* had a page on their website with a whole collection of woodshop plans. I'm hoping it's still there. These were scaled drawings of about 300 woodshops, and the URL was <http://www.finewoodworking.com/workshop-floor-plans>

Resources such as that can give a woodworker great ideas about workflow and layout. But each shop is unique, because each woodworker is unique. We like to build cabinets or birdhouses, boats or bedroom furniture. Whether the shop's function is casework, turning, marquetry or carving, there's an arrangement that will only be comfortable for one person. We can learn from others, but we can't live in their shoes.

Perhaps the best advice is to make a scaled drawing of the space available, and then make paper cutouts that roughly represent the size of each machine or fixture that you think you'll need. For example, if you're considering turning bowls, you'll need a place to store blanks, a band saw, a lathe (or perhaps two), a cart for tools, some dust collection, and a place to let finished pieces dry. If you're using traditional high-speed steel tools, you'll also need a sharpening station. (If you go with carbide insert tools, you won't need that.)

Turning is a great way to get into woodworking, because it requires relatively little equipment (compared to furniture).

If you're looking at cabinetry, then the equipment list will include a jointer, table saw, miter saw, thickness planer, router table, hand tools, a few small dust collectors (usually more efficient than one big one), a decent workbench, drills and a router, perhaps a circular saw, a band saw, various sanders, a drill press, some kind of assembly table, a clamp rack, a cabinet for storing portable power tools, a biscuit joiner... oh, and a second mortgage.

The hand tools include a decent set of bench chisels, a couple of mortising chisels, a jack plane, two or three block planes, a smoother and some sort of sharpening station.

One can, of course, start a whole lot smaller than that by investing in hand tools first. Well, not exclusively. You'll still need a table saw at the very least, but used ones are widely available in venues such as craigslist™, eBay™ and the local newspaper's classified section. Check that the motor works, and the arbor runs true (does the blade wobble?). Then take a good look at the fence. The ones that come with many older saws are absolute rubbish, and often dangerous. But you can transform a basic old contractor saw into a piece of precision equipment by adding a decent aftermarket fence from a company such as Mule (mulecab.com), [Biesemeyer](http://Biesemeyer.com), or my personal favorite, Vega (vegawoodworking.com). You may have to fiddle with an older saw to make the blade parallel to the miter slots. And then you can upgrade the miter gauge with one from manufacturers such as [Incra](http://Incra.com), [JessEm](http://JessEm.com), or a little company in Durant, Iowa called Woodhaven (woodhaven.com). The president, Brad Witt, has been building absolutely beautiful jigs for woodshop equipment since 1983.

Out-feed and In-feed Issues

If you're drawing a floor plan, don't forget to include feed areas. For example, a table saw that sits in the center of a cabinet shop will need room in front and behind for a full sheet of plywood, so it can completely clear the blade for rips (along the grain) and crosscuts (across the grain). There will also need to be room to stand comfortably behind the sheet. Woodshops that make picture frames need room for long moldings on both sides of the miter saw. A jointer or planer will need room for long boards on either side of the knives: a lot of woodworkers whose shops are in the garage just open the overhead door for this.

If space is an issue, making the workbench 1/16" lower than the table saw allows it to be used as an out-feed table. This arrangement works best when the bench has locking casters, so it can be moved into position easily. However, it means that all the cuts need to be done on the saw before the bench is free to be used for assembly.

Projects being put together take up an awful lot of room, especially if there is more than one unit (such as kitchen cabinets), or there are lots of drawers or doors involved. It's not just storage room that's required: one must also allow elbowroom for the woodworker.

Light and Power

The better the lighting, the better the work.

You can almost never have enough lighting. If the shop is lit up like a landing strip, then every tiny flaw will be visible. When the project then moves to a room with normal lamps or daylight, the fit and finish will look impeccable in muted illumination.

Using just one type of lighting can be restrictive. For example, halogens are warm and somewhat confined or focused, while fluorescent bulbs throw light that is often cool and abundant. Daylight has a temperature of about 5800k (Kelvin), and getting close to that works well in a woodshop, especially if you're doing photography as you go. Yellow light in the lower ranges (3000k) gives a warm and comfortable glow, but it can mislead you when it comes to stains, finishes, paint and other color or tone issues. Many bulbs will list the Kelvin range on the packet, or you can Google™ it.

It's a good idea to paint the walls stark white in a workspace. That will allow light to bounce around and amplify. Dark walls absorb the light, and off-whites distort it.

You'll need at least one portable light source so you can have a raking light. That's a lamp that shines across a surface, and any imperfections show up as tiny shadows. LEDs work well.

Provide extra bright task lighting in any area where injuries might occur, such as around router bits and table saw blades.

Extension cords are not a great idea in a woodshop. They can cause circuit overloading and fires. Plus, you wouldn't be the first woodworker to trip on a cord and reach into a spinning cutter while trying to catch his balance. Extension cords fray, get sliced by circular saw blades, and have often been repaired. Any of those conditions can cause sparks, and that can be serious around airborne dust or dust collectors. It doesn't cost a lot to have a few outlets installed exactly where you need them. Most building codes will require ground fault (GFCI) or arc fault protected outlets or circuits in shops and garages. If you have a couple of circuits added, it's also nice if the breakers are right there in the shop, in case you need to kill the power. Plus, if outlets are being installed, the electrician can add a few 220V ones. Then the shop can be outfitted with machines that have larger, more powerful motors. Many commercial woodshop machines run on 3-phase current, and few residences have that available. If you do, there's a lot of inexpensive, used 3-phase equipment out there. Chat with an electrician about your options before buying anything.

Dust Collection

If you're a pro running wide belt sanders and shapers all day long, then you need a central dust collector. If you're the average serious hobbyist, a central system may not always be the best choice.

Let's look at a few common dust collection terms. A single stage collector has a hose that delivers debris to a collection bag. A two-stage model has a device on board that sorts heavy particles from light ones. The idea is that the big bits won't damage the fan (impellor) blades, and the light dust gathers on the inside of the top (filter) bag.

CFM means cubic feet per minute. It's the way air volume is measured. A little 1HP collector will move maybe 400-500 CFM, and a big 2HP unit will push close to 1,500 CFM.

Static pressure (SP) is a term that's thrown around a lot, but don't pay too much attention to it when buying a dust collector. That's because the manufacturers generally quote the CFM at an extremely low SP. If you want to read up a little on it, visit Bill Pentz's website (billpentz.com//woodworking/cyclone/dc_basics.cfm). It's a great resource if you're designing a whole system. And you need to understand SP if you're installing lots of ductwork and ports. A port is a hole in the machine or the collector, to which a hose is attached.

The simplest collectors have two bags. The bottom one collects the dust and the top one filters the air before returning it to the shop.

A cyclone is a very efficient collector that swirls the air in a gyre (vortex, spiral – something akin to the way air moves in a tornado) and uses gravity to sort the residue into fine and gross particles. If equipped with a HEPA filter (rather than a simple bag) it can be extremely efficient, trapping dust down to 1 micron or less.

A micron (μm) is one-millionth of a meter. A human hair is about 60 microns. OSHA says: "*respirable dust refers to those dust particles that are small enough to penetrate the nose and upper respiratory system and go deep into the lungs. Particles that penetrate deep into the respiratory system are generally beyond the body's natural clearance mechanisms of cilia and mucous and are more likely to be retained.*"

Essentially, that means that hair and mucous will trap dust above about 10 microns. Excessive dust is the problem. Not every little particle will kill you, but over-exposure, especially over time, can often be carcinogenic, especially in the nose. Even if your collector isn't scrubbing the air so thoroughly that it's completely devoid of particles, as long as it's removing most of the dust, it's helping a lot.

Dedicated dust collectors (one for each major machine) can be quite inexpensive. For example, grizzly.com usually sells a basic two-bag, single stage, 1HP dust collector with a 110V motor and a single 4" port for about \$200. At right is their model G8027 from 2015, which generated 500 CFM at 2.76" of static pressure with a 30-micron bag. For a hobbyist, that should handle most of the waste from just about any machine.



Courtesy Grizzly.com

A 2HP, 2-stage cyclone unit costs about eight times as much for a basic model. Yes, it can handle several machines simultaneously, and if you're setting up a cabinet shop, that is what you need. But if there's only one guy in a hobby shop, then there will only be one machine making sawdust at a time. By installing one of these small collectors on each machine (three or four total), the hose runs will be very short. Long runs create resistance, cutting down on the velocity (speed) and pressure (SP) of the air being moved. Plus, a small collector uses a lot less electricity than a big one. Dedicated collectors mean there's no need for blast gates. Those are simple devices that shut down the ductwork to one or more machines that aren't running, so there is more suction created at the one that is.

There are several inexpensive electric switch systems on the market, from companies such as Rockler or Woodcraft. These will automatically turn on the dust collector when a machine is turned on. Just plug the collector and the saw, sander etc. into the module.

If a larger central collector is being used, there are electronically controlled blast gate systems that will automatically open and close them as the machines are used. These are only used where several machines are hooked up to a single dust collector.

Most small shops will need dust collection at the planer, jointer, table saw, miter saw, router table and belt sander. By combining the jointer and saw, and the miter saw and router table, you're looking at four units. If you only have one big collector and the motor goes out, you're sunk. But with four little ones, you can get by until a replacement arrives. Plus, think of all the time and money you'll save by not having to install all that ductwork. Or the blast gates...

Sizing a dust collector is pretty basic. For dedicated small units, just look at the CFM rating for each woodworking machine (in the owner's manual), and buy a collector that's a little bigger than that. If you're going to attach more than one machine to a larger central unit, then you need to take a look at how to design a ductwork system on airhand.com/designing. There, you'll find information on how much static pressure is lost in ductwork runs, and how to compensate for that. Air Handling Systems has been around since the 1950s and the staff is extremely helpful and knowledgeable.

Another fine resource is a Taunton book by Sandor Nagyszalanczy titled [*Woodshop Dust Control*](#) (ISBN 978-1561584994). Sandor writes from the point of view of serious hobbyists and small professional shops, and he covers a lot of ground in great detail.

If you already own a collector and want to maximize its efficiency, talk to the experts at AFF (americanfabricfilter.com). They custom size filter bags, and they can explain how a small collector's performance can improve dramatically by increasing the filter area. It's very inexpensive and makes a huge difference in performance. AFF has spent two decades "designing and fabricating optimized custom dust bags and sleeves to go on collectors ranging from 1/3 HP drum top hobbyist units, to 100+ HP factory bag house systems". They really know their stuff. It's not just about size: the weave and the fabric thread make a difference, too.

Pneumatics

If you're going to use an air compressor in the woodshop, here are a few thoughts. Don't leave the compressor plugged in, or if you do, have it on a switched outlet that you can turn off at night. A lot of woodshops have burned down because the air system had a leak that caused the compressor to run continually and overheat.

Instead of installing expensive metal compressed air lines in the shop, you can just attach a cheap, flexible hose to the ceiling with pipe clips and have it run from the compressor and drop down right above the workbench or assembly area.

Don't plug a portable small compressor into an extension cord. Resistance will cause intermittent problems for the pump (voltage loss), and the motor will not like having to operate on half rations. It is ALWAYS better to run air hose instead of electric cords. And heavy 10-gauge extension cords are not a solution, as they will be plugged into a household circuit that is wired with 12 or even 14-gauge wire.

It's a good idea to put a permanent air filter on the compressor, and then plug the hose into that. Or you can attach a moisture/dust filter to the shop wall, and plug the compressor into it with a very short length of hose, and then plug the line into that.

Drain the compressor regularly (see the manual). If you're in a humid part of the country, the tank can fill up quite a bit in a very short time, and even start rusting from the inside. Moisture will definitely contaminate finishes. And if you're using the compressor to spray finish, locate it in another room so that airborne volatiles don't come in contact with the hot motor, or get sucked into the tank.

It takes a really big tank to keep up with pneumatic sanders and other tools used in auto-body shops, and the tools are a bit unwieldy because of the air hoses attached to them. Electric sanders and cordless drills seem to work better in a woodshop.

Final Thoughts

Multi-function machines rarely live up to our expectations. If a machine is designed to replace several stand-alone pieces of equipment, it can probably do all of the things those other machines can, but in my opinion it can't do any of them quite as well. I used to own one once, which I thought was an incredible drill press and it had a very functional disc sander. But the table saw function on it scared the living daylights out of me because the table – and not the blade – tilted. Its overhead router only ran at 5200 RMP at top speed: our standard variable speed shop router, Hitachi's M12VC, tops out at 24000 RPM and delivers extremely clean cuts. A multi-function machine can be a wonderful solution if you have no space, but I'm a lot happier with my stand-alone machines.

Get the longest and widest jointer you can afford. A long bed makes boards straighter. A wide bed means there will be a whole lot less gluing in your future. Old-fashioned high-speed steel (HSS) knives deliver results that are – in my opinion, which is based on doing this professionally for 35 years – every bit as acceptable as heads with small square carbide inserts, and they do so at a fraction of the cost. The trick is to keep the knives sharp and properly adjusted, and feed the work slowly.

As noted before, any decent table saw with a great aftermarket fence should give you years of satisfaction.

Oh, and I always feel a woodworker should build his/her router table, rather than buying one.