



*When it comes to planning a layout, a model is even better than the real thing. You can visualize spatial relationships and evaluate how light affects workspace. Here, luthier John Monteleone experiments with his shop's layout.*

# Laying Out a Workshop

*Planning for workflow and flexibility*

by Scott Landis

Many people begin woodworking by using part of their house-basement, garage, pantry, attic-as a shop. There is no perfect location; one person's dream is another's nightmare. Although you may not have much choice in the location of your workshop, what you do within its walls is entirely up to you. (Unless, of course, you have to share that space with the family car or three other business partners.) Nothing less than your safety, efficiency and enjoyment hang in the balance.

The factors that affect shop layout—from the height of the ceiling to the size of your wallet and the type of work you do—vary greatly. The selection of machinery, for example, relates strongly to layout, as do wood storage and dust collection. In fact, just about

everything that goes on in the workshop has something to do with the subject. This was quite evident as I visited dozens of professional and amateur shops to take a close look at the basic systems that constitute most modern workshops. I asked shop owners to explain how they selected and located equipment in order to foster efficient work flow and safety. The workshop, I discovered, is not a static creature. Like the craftsman who uses it, the shop constantly evolves to accommodate the changing needs of its occupants. What follows is a discussion of the principal considerations involved in laying out any workspace. In the sidebar beginning on p. 57, I'll show you three examples from the wide variety of workshops I visited.

## Planning the workshop layout

If you've ever chopped tails on both parts of a dovetail joint, you'll appreciate the value of good planning. With all of the elements involved in putting together a shop, which is a lot more complicated than a piece of furniture, you'd be well advised to start with a pencil and paper, and a good eraser.

Before you start sketching floor plans, it's a good idea to make a few priority lists. Begin with your equipment. Make a list of every tool (large and small) you currently own or expect to buy, and rate its importance. Consider not only how much space each tool requires for efficient operation—the most you'll need and how little you can get by with—but also how often you use it and for what sorts of operations. This exercise may reveal some surprising, even unpleasant information. The size or expense of a tool may bear little relationship to its importance in your shop. For example, if you use a bandsaw only for occasional resawing of heavy timber, you may be better off consigning it to the woodshed rather than having it consume valuable shop space.

Take an inventory of materials and hardware, and review how they typically get used up. If you are overrun by a mountain of precious lumber that you rarely use but hate to part with, you might take a hard look at other storage solutions.

The priority lists will generate all the information you need to begin your workshop design. The process should also serve as a catalyst for asking basic questions about your work habits. What temperature are you comfortable working in? What sort of light do you prefer, and how does it vary with different operations? Do you spread your work out or burrow in? Are you neat, or are you a slob? If your dream shop is somewhere in your future and you are currently working in another space, take the opportunity to examine the ways in which the current shop aids or hinders your work. By analyzing your daily routine—how many trips you make to the bench, how many times you start the saw—you'll add valuable layers of information to the plan.

There are several good ways to develop a floor plan. You can outline the perimeter of your shop on a sheet of paper and simply sketch in the equipment, but a method that allows you to move things around and try out many different possibilities is likely to give you the best results. You can cut out pieces of paper or cardboard to represent each tool and move them around on a floor plan until you get a setup you like. Be sure to represent the equipment and the shop space to scale. Carefully consider the direction of feed for each machine and the amount of space required for each operation. A few inches can make a big difference.

Like Maurice Gordon, whose shop is discussed in the sidebar, an increasing number of woodworkers use a computer and design program to lay out their shop. By printing out different versions, they can compare many possibilities. Gordon used a computer-aided design program to work up his floor plan. He entered each machine, bench and other workshop fixture as a separate component in the drawing, so each could be manipulated without affecting the overall floor plan. The program's 256 overlay functions made it easy to develop lighting, electrical and dust-collection plans, just as an architect would use transparent drawing overlays. The program is pricey, and Gordon uses it in his "real-life" engineering business, but less expensive (and perhaps less elegant) drawing programs are available that would work fine for a shop floor plan.

After the floor plan, you might draw some elevations—if not for the entire shop, then at least of some walls. Vertical layout is an important factor in the efficiency of any floor plan, but it is particularly so in a small space where the height of adjacent tools and work surfaces are critical. Elevations will wean you away from the flat plan and get you thinking in three dimensions.

If you have trouble thinking in three dimensions, try making a model. After working for years in a decrepit, dockside machine shop on Long Island, luthier John Monteleone wanted to be sure that his new workshop would be worth the wait. So he started making models—benches first, built to a 1-in. scale. "Things started out simple," he says, and then I got enthused!" He measured each tool and cut the corresponding model out of pine on the bandsaw, sticking the parts together instantly with cyanoacrylate glue and spray accelerator. He spent several days in the process—almost two hours on the thickness sander alone. His results are shown in the photo on the facing page.

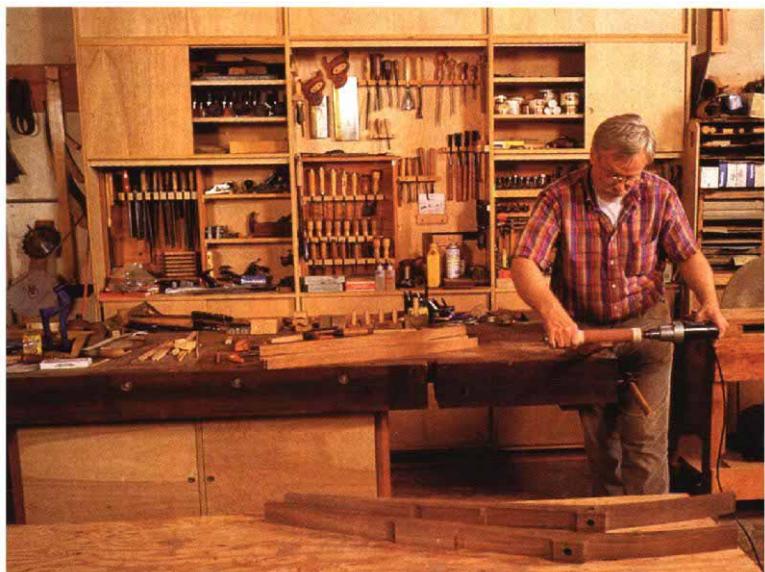
## Adding flexibility into the plan

Good layout is more than just deciding where to put your equipment. Limited space or a variety of woodworking projects will make flexibility critical in most small shops, while in larger shops or production and specialty shops, where the type of work is more predictable, only certain areas need be flexible. As one woodworker told me, "As much as I'd like to bolt things to the floor, I don't because I never know when I'll have to push something over a few inches to allow for some other operation."

Flexibility is most often expressed in the selection and orientation of machinery. In the majority of shops I visited, the tablesaw occupies a pre-eminent position in the middle of the floor. A tablesaw demands space on all four sides. By contrast, all other major pieces of commonly used woodworking machinery—radial-arm saw, jointer, planer, bandsaw, drill press and shaper—require space in only two or three directions and can be placed against a wall.

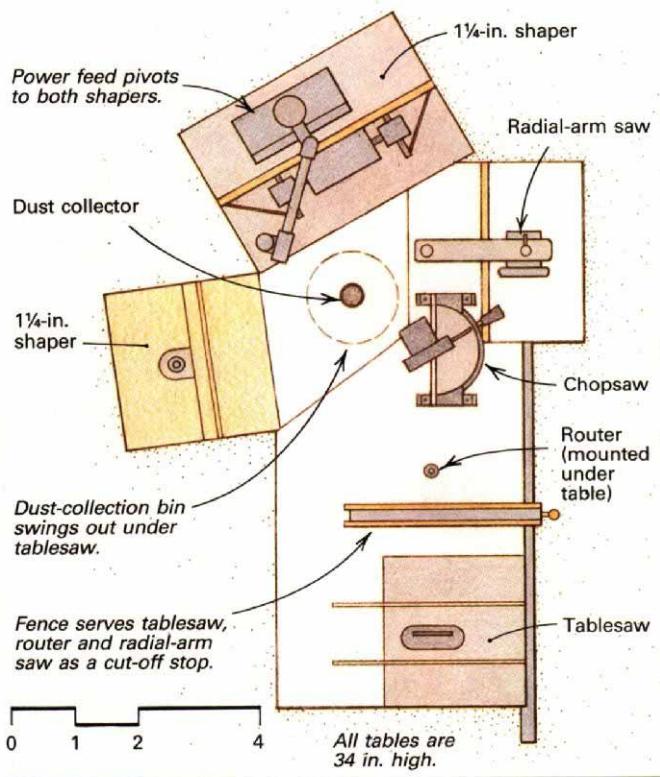
Arranging the machines around the perimeter of the shop, or even isolating them in a separate machine room, liberates the bulk of the floor space for a constantly changing flow of shop projects. Flexibility is enhanced by folding outfeed tables or portable outfeed horses and rolling tool carts, clamp caddies and assembly tables.

As important as flexibility is to most shops, good organization also requires a careful analysis of what kinds of things you do repeatedly and in what order. If you make solid-wood furniture, for example, you are likely to follow a similar sequence of operations regardless of whether you're making a highboy or a chair. You saw



**Portable benches and a portable shop-built router table** allow John Nyquist to make flexible use of his shop space. His workbench sits between the cabinets that hold his hand tools and portable power tools and a 4-ft. by 12-ft. assembly table.

### Ike Klassen's tool cluster



and plane rough lumber to dimension, cut joints and shape parts, assemble them, and then apply finish. Unless you're really pressed for space, it probably makes more sense to put your tablesaw or bandsaw, rather than your finishing area, next to your jointer and planer. If you work mainly with plywood, or do a lot of turning, you can also identify an overall order to your work, one you'll usually, if not always, follow. Determining that order, or workflow, is the first step to finding the best relationships between the components that make up your shop.

### Workshop triangles

A useful way to consider organizing workshop space is in terms of work triangles, which describe the relationships between several different tools within a single work area.

Perhaps the most fundamental workshop triangle is formed by the workbench, tool chest and assembly area. The relationship between these elements is apparent in John Nyquist's shop (shown in the photo on the previous page). Nyquist, who builds about 30 pieces of furniture each year in his Long Beach, Cal., workshop, can easily get any hand tool he needs while working at the bench. The tools are arranged in the built-in wall cabinets according to their size, function and frequency of use (similar tools—marking and measuring tools or saws, for example—are grouped together). A low assembly table is accessible to the bench, which may be needed for making final adjustments as the piece is put together.

The importance of the relationship between the workbench, tool chest and assembly area should not be underestimated. Their relative positions will vary widely, of course, depending on the shop space and the nature of the work that's performed in it. Where the work is relatively small and refined, as in some musical-instrument shops, hand tools, workbench and assembly stations are within arm's length of each other.

Power-tool work triangles are at least as variable as bench and assembly triangles. Someone who does a lot of resawing may want an arrangement where the bandsaw, jointer and cutoff saw are close together. A power-tool triangle can be a straight line, which makes for efficient movement between tools. Curds Erpelding, of Seattle, Wash., situated his tablesaw, jointer/planer, thickness sander and bandsaw side by side in a compact line down the middle of his shop. The machines are oriented so that work is fed across the line (and the shop). That way, Erpelding can push a long board through the tablesaw without having it bump into the jointer. With this arrangement, Erpelding's shop is wide enough to allow 10 ft. of infeed and outfeed clearance on either side of the line.

Figure 1 at left shows a compact work triangle in the center of Ike Klassen's 20-ft. by 24-ft. workshop in Winkler, Man., Canada, in which several tools share the same dust collector and the surfaces of their tables. The 4-ft. by 6-ft. homemade saw table makes it easy to cut large panels in any direction and provides an extended work surface for the adjacent radial-arm saw. A T-square fence serves both the tablesaw and the router (mounted beneath the saw table) and acts as a crosscut stop for work on the radial-arm saw. The two shapers share a single power feed. The tool cluster allows about 10 ft. of clearance on either side of the radial-arm-saw blade.

### Dedicated spaces

Separate areas of the shop may be designated to specific tasks, such as carving, metalworking and gluing up. In many shops, I found small, dedicated zones set aside for tool sharpening, their location dictated mainly by good natural light and running water, or by proximity to the bench area or a particular machine. Turners, for example, frequently locate a bench grinder within arm's reach of the lathe.

Every dedicated workspace, of course, implies a loss of flexibility, and the value of the trade-off depends upon the type of operations you perform in the shop and how frequently you perform them. If you regularly begin your shop routine with a meditative tool-sharpening session, as a few woodworkers I met like to do, a designated sharpening area might make sense, although sharpening stones are easily moved and don't usually require their own bench. Likewise, if your winter shop temperature hovers around 50°F, you may have to set up a separate gluing or finishing room.

It is theoretically possible to divide the entire workshop into a matrix of task-specific work zones, but such an extreme division of space may eventually provide diminishing returns. Many woodworkers speak longingly about an "ideal" workshop in which the machinery would be physically located away from the bench space. Several mentioned visiting workshops in Europe where machine shops occupied separate buildings. Isolating machines from the rest of the shop has an obvious advantage where a number of people share a shop—the machines can be roaring away most of the day and not disturb the concentration of those doing fussy handwork elsewhere.

If you work alone, separating your machines from the rest of your shop may be more a matter of personal style or habit than one of necessity. For example, you may adopt a cautious demeanor when you approach your machinery, while you feel more relaxed or introspective at the bench. Isolating these functions in physically separated quarters may enable you to develop a safe and more efficient routine; such an arrangement will certainly affect the quality of your work and the enjoyment you derive from it. □

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# Working in a small space

There are as many solutions to the problem of laying out a small workshop as there are creative woodworkers. The following drawings and photos represent three workshops you might find in a garage or basement anywhere across the continent. But in each case, the owner has demonstrated a special ability to shoehorn his priorities into a modest floor plan.

**A minimalist shop:** At just 12 ft. by 22 ft., Dick Sellew's shop is the smallest professional cabinet shop I saw.

When he set up shop in an old shed in New Marlborough, Mass., Sellew explains, "I wanted to enjoy my work." After 14 years in a San Francisco, Cal., production shop, he was determined to see how little he needed to get by. As a result, he spends less on rent than many cabinet shops spend on sharpening (a mere \$20 per month), and most of his machines are cut-rate imports. "I can actually make more money here than I could with state-of-the-art equipment and 10 other guys." And he lands jobs that bigger shops can't touch.

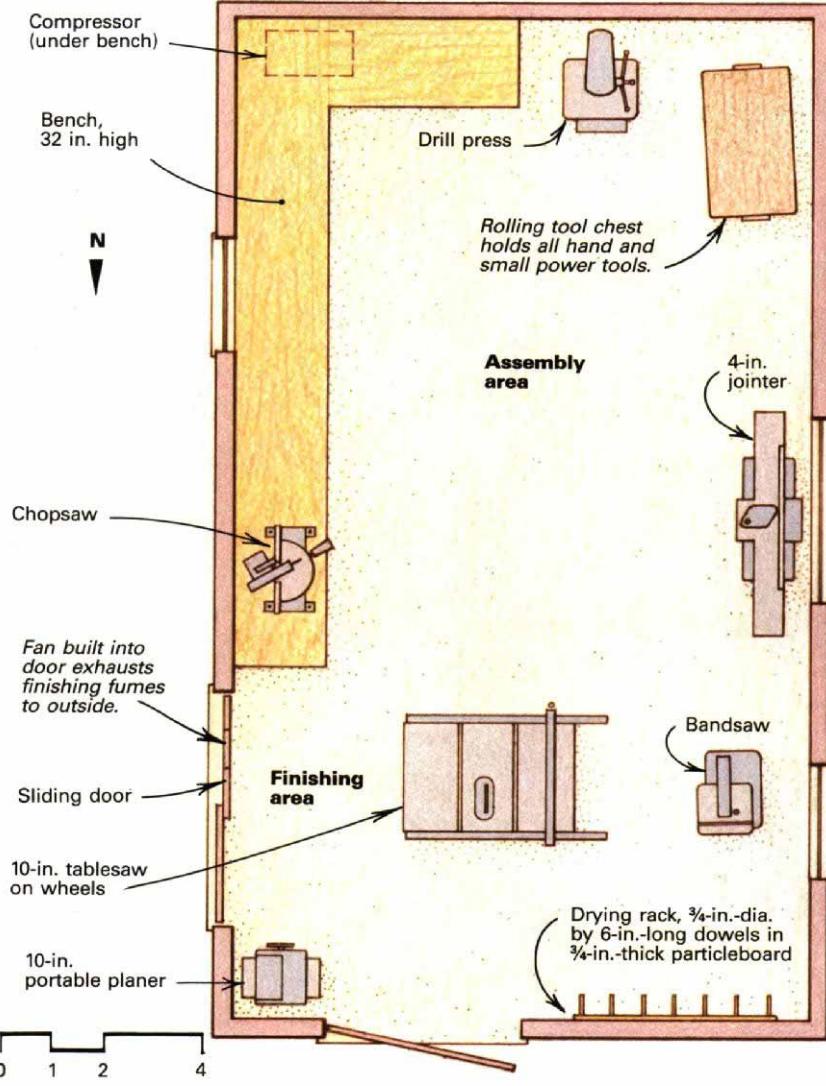
Apart from his tablesaw, which occupies a space near the door, everything else is arranged around the walls. This leaves as much room as possible in the center of the shop for assembly (see the drawing at right). Instead of a shaper, Sellew mounts a large router in a shop-built router table that sets up on sawhorses. When not in use, the setup packs away in a cabinet. A chopsaw fixed to a table along one wall does the cutoff work of a radial-arm saw. An assortment of six tablesaw sleds, or trays, is used to perform a variety of cross-cut and miter operations. Planing and edge-jointing are done on a 4-in. jointer and a portable 10-in. planer. When the weather is nice, he puts the planer on a telephone cable spool and works outside (see the photo below).

Open rafters and a gable roof provide storage space and room to swing long boards. Wood is stored in an adjoining shed. Three radiant electric panels on the ceiling heat the shop quickly and consume virtually no space; their white surfaces also reflect light. Sellew sprays finishes right in the front of the shop (he admits the hazardous nature of the practice); he simply rolls the tablesaw out of the way and turns on a fan to blow the fumes outside. A wall-mounted rack near the front door holds the pieces while the finish dries.

"To be honest, I didn't think it would be as easy as it has been," Sellew says. "But even in a 6,000-sq.-ft. shop, I'd assemble in a space no bigger than this."

**Sharing the shop with a car:** When Maurice Gordon's only major tools were a Shopsmith and a Sears tablesaw mounted on casters, it was relatively easy to share

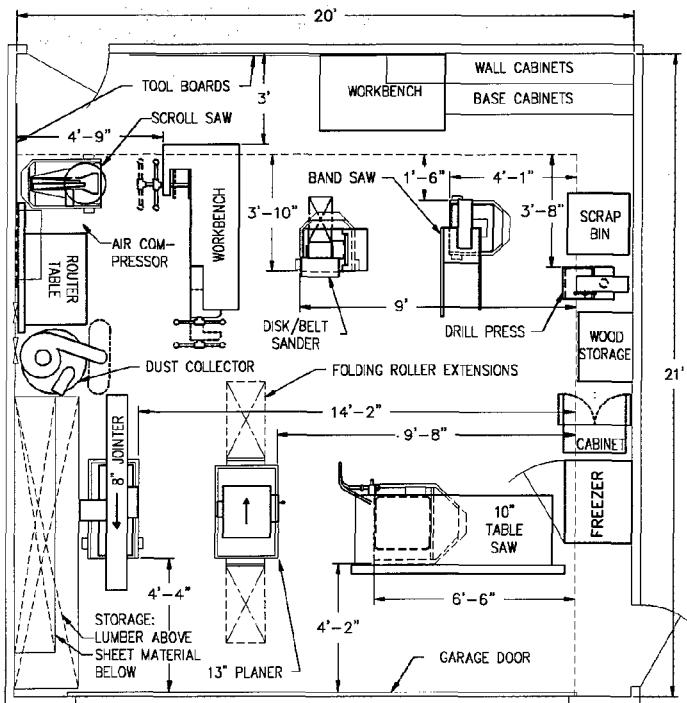
Dick Sellew's minimalist shop



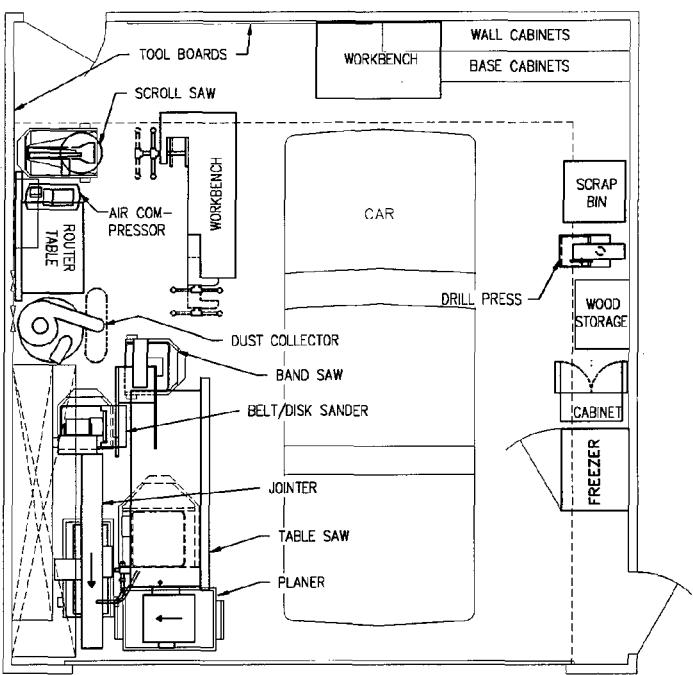
*Dick Sellew can handle big projects in his tiny workshop. In good weather, he moves his planer outdoors. The wood storage shed (on the left) is almost as big as the shop.*



## Maurice Gordon's computer-aided shop design

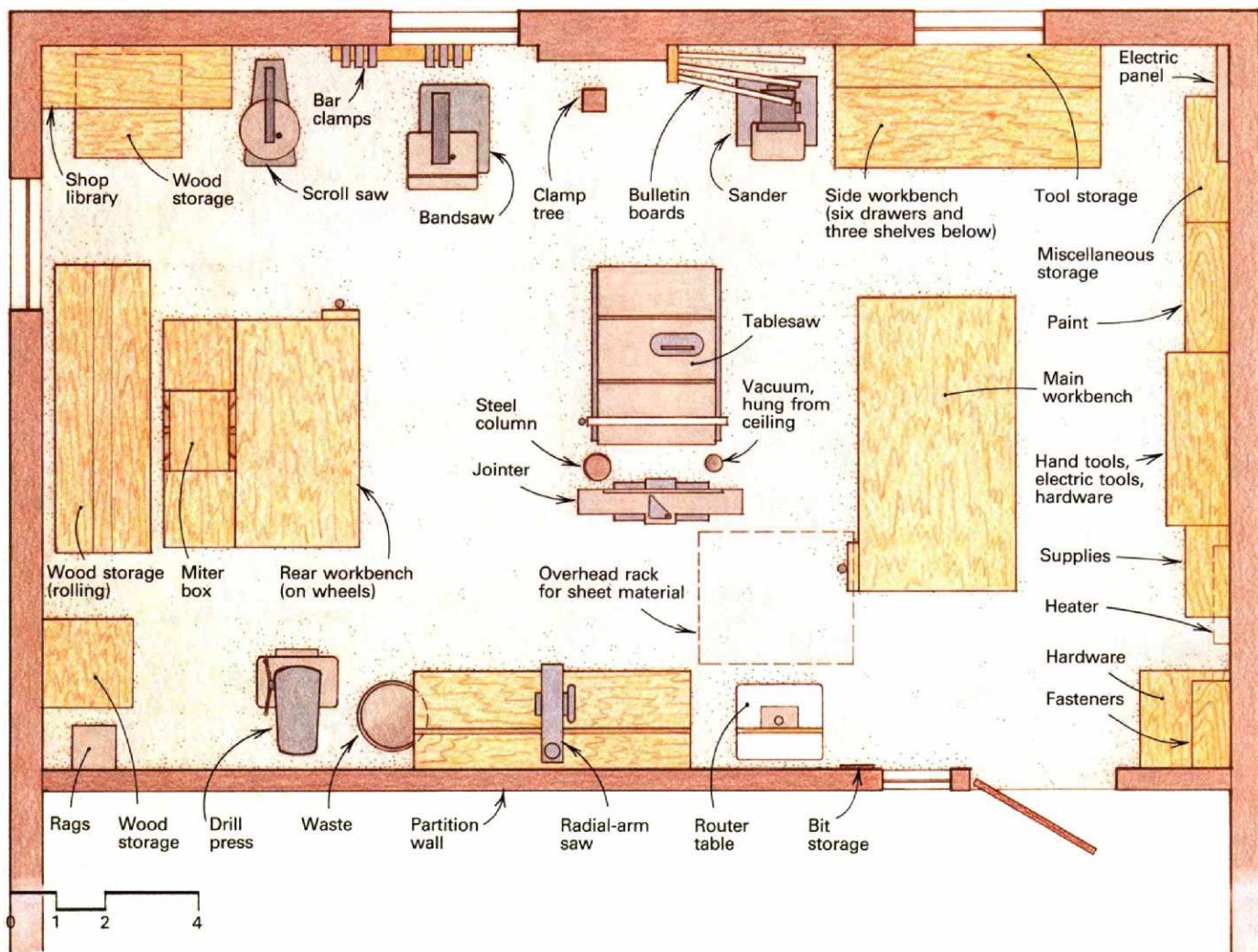


Workshop knocked down for parking



Computer drawings above, Maurice Gordon

## Jim Whetstone's basement shop



space with the family car in his Houston, Tex., garage. The situation became more complex, however, as his woodworking turned professional and he replaced his tools with single-purpose machinery.

In 1988, Gordon considered his needs—a full-function shop with sufficient space around the stationary equipment and room for one car when the shop was not in use. That's a tall order for a 420-sq.-ft. attached garage. Gordon used a computer-aided design (CAD) program to organize his power tools, benches, fixtures and storage. The program allows him to move individual outlines of his machinery around on the computer screen to decide where to put the tools, (in real life, the tools that need to move are on rollers.) Using the overlay feature of the CAD program, he also designed a lighting plan for his workshop.

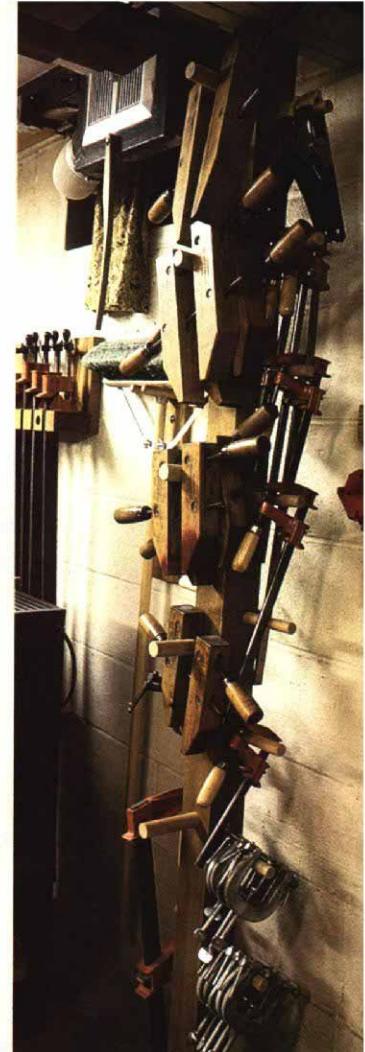
The arrangement, shown in the drawings at the top of the facing page, is not perfect—the garage door must be opened to saw large sheet stock or to surface long boards—but it would be hard to improve. Active and stored tool locations are painted on the cement floor, enabling Gordon to set up the workshop or to knock it down in five minutes.

**A well-organized basement shop:** Organization and storage are more than a luxury in most basement workshops. Jim Whetstone's shop in New Cumberland, Pa., is as highly organized and economical in its use of space as any I've seen. As the floor plan at the bottom of the facing page shows, Whetstone located his major power tools near the centerline of the shop. Three workbenches surround the machinery, and wood storage is at the far end of the shop. This arrangement allows him to rip 4-ft. by 8-ft. sheets of plywood on the tablesaw and cut 14-ft. lumber on the radial-arm saw. It also provides space to lay out, construct and finish a variety of projects.

The ceiling and partition between the shop and the rest of the basement are of drywall construction, which makes for easy maintenance and sound insulation and aids fire prevention. Electrical boxes hang from the ceiling to keep cords off the floor. For safety and convenience, Whetstone color coded the circuits—red for lights and orange for equipment. To promote order and style, he painted his cabinet cases and door frames green and the doors blue. I was impressed by the number of clever storage ideas he had come up with, one of the reasons he's able to cram so much in such a small space and to keep it neat. Two of these are shown in the top photos above.

Although the shop appears to be complete, according to Whetstone, it has evolved a little bit each year since it was built in 1974. "It is not finished," he explains. "No true woodworker with a reverence for wood, order and quality is ever satisfied with his workplace. It will grow as I grow."

—S.L.



**Creative storage:** Jim Whetstone made a 34-in.-sq. rack (above left) that pivots down from the ceiling to provide access to sheet goods. He stores hand-screw clamps on a 4x4 "tree" (shown above right).

**Whetstone gets a lot of mileage out of his small basement workshop** by making sure that there is a place for everything and that everything is in its place. Whetstone has used his ceiling space as efficiently as the floor and walls. Electrical outlets are mounted on the ceiling to keep the cords off the floor, and drill bits are kept handy in a ceiling-hung rack above the drill press.

