Shopping for Drill Bits

Choose the right one for easy drilling through wood, metal or synthetics

The latest catalog from the Precision Twist Drill Company is like a souvenir from the Rust Belt: It offers parabolic-flute twist drills for boring forged crankshafts, high-speed steel twist drills with 90° points that drill spike holes in railroad ties and even tapered drill bits that trim doorsills on 747s.

Truth is, though, I've seen builders drill bits that are just as exotic. There are bits that drill carbon steel and stainless steel, fir and Formica, glass and Plexiglas, plaster and lath. There are woodboring bits that cut through nails and others that bore through walls and allow you to pull electrical wires back through.

With the right drill bit and motor, virtually any building material can be drilled—fast. In this article, I'll describe most of the professional-grade drill bits that might be useful on a job site (except for masonry bits and one-of-a-kind specialty bits, which we'll save for future articles) and tell what features to look for when selecting a bit for a particular drilling task. The sidebar on p. 75 tells where to find the drill bit you're looking for.

Twist drills: Metallurgy and tip geometry dictate performance

A typical twist drill (photo, right) is a metal shaft with at least one spiral flute. There are many variations, but your local hardware store probably stocks most of the twist drills that homebuilders need for residential work. Twist drills generally are designed for boring metal, wood or plastic. But for best results in a particular material, you'll need to consider the type of steel used for the drill bit, special bit coatings and the shape of the point, not to mention the diameter of the bit, the overall length and the flute length.

Match the size to the job—Twist-drill diameters normally range from less than ¹/₄₄ in. to 1¹/₂ in. Diameters aren't always listed in fractions; some twist drills come in wire-gauge and letter (A-Z) sizes that fill the gaps between 64ths for drilling precise holes. Metric sizes match metric hardware. These nonfractional sizes are more useful to machinists, mechanics and others who tap holes and rivet than they are to builders.

Large-diameter twist drills are available with reduced shanks— $\frac{1}{4}$ in., $\frac{3}{8}$ in. or $\frac{1}{2}$ in.—so that you can select a shank size to fit your drill chuck. Some twist drills have flattened shanks that won't by Bruce Greenlaw



slip in drill chucks. Better yet, hex shanks not only don't slip but they also let you swap a twist drill for a hex-shank screwdriver bit without adjusting the jaws of the chuck. This feature can be a real time-saver when installing a lot of screws that need pilot holes.

Twist drills come in assorted lengths. Categories include screw-machine length (short), jobbers length (standard), mechanics length (standard with short flutes), taper length (long) and extra length (extra long with either short or long flutes). Extra-length drills with short flutes are called aircraft-extension drills or simply extension drills, and those with long flutes are called straight-shank drills or long boys.

Flute length, not overall length, determines drilling depth. For most job-site applications, jobber-length bits offer the best compromise between drilling depth and durability.

There's at least one type of twist drill that doesn't come in conventional lengths. Bell hanger, or installer, bits measure from 12 in. to 48 in. long, with diameters ranging from $\frac{3}{16}$ in. to 1 in. Designed for installing telephone, television and security-system wires, these bits allow you to bore through walls, ceilings or floors, then to pull a wire back through by attaching it to a hole in the flute gullet.

Metal matters—Chris Petrucelli, a senior product manager of American Tool Companies, recently watched a contractor burn up a couple of high-speed twist drills trying to bore holes through a steel I-beam. Sensing futility, Petrucelli gave him a couple of cobalt twist drills to try. They worked. Cobalt twist drills are the best choice for boring stainless steel, chrome, heattreated bolts and other hard, abrasive materials that generate high drilling heat. But cobalts are expensive: A ¼-in. dia. cobalt bit, for instance, can cost \$3 or more. For less demanding work, bright-finish or black-oxide coated high-speed steel bits are a better buy.

High-speed steel refers to various alloy steels used for making cutting tools that hold an edge at high heat. Most builders twist drills are made of MI, M7, M50 or M52 high-speed steel. MI steel works well for boring most metals. M7 is similar to MI, but it resists abrasion better. M50 and M52 are economy-grade steels for light- to mediumduty work. The best cobalt bits are made of M42 cobalt-alloy high-speed steel.

Generally, bright-finish, high-speed steel twist drills work well for boring most metals, woods and plastics. For about the same price, black-oxide-coated bits are ideal for boring most iron and steel materials. Black-oxide coating thwarts rust, prevents metal shavings from welding to the cutting edges and helps retain cutting fluids. Blackoxide coated bits shouldn't be used for boring nonferrous metals, which can clog flutes. Both types of high-speed steel twist drills cost about 30% to 50% less than cobalt ones.

The latest phenoms on the market are highspeed steel twist drills coated with titanium nitride, or TiN (photo, bottom right). This seductive, gold-colored coating is harder than tungsten carbide and has high lubricity, producing twist drills that, according to advertisements, last as



Brad-point bits cut clean holes in wood. Unlike conventional twist bits, brad-point bits have a pair of spurs that scribe the circumference of the hole and prevent splintering.

Titanium-nitride coating makes bits last longer. Manufacturers claim that a twist bit with this special gold coating will last 6 times longer and drill 75% faster than a conventional high-speed twist bit.



much as six times longer and penetrate metal 75% faster with 25% less effort than uncoated high-speed steel twist drills do. These bits also bore wood or plastic. But they're even more expensive than cobalt bits.

Not all colored twist drills are coated. The black and gold colors on some bits are produced by heat treating. Check the wrapper.

Twist drills also are made of low-cost carbon steel or chrome-vanadium steel. You can get by drilling wood with these inexpensive bits, but if you plan to bore holes in metal, you're better off with high-speed steel.

What's the point—Developed for boring deep holes in automobile crankshafts, split-point drills penetrate metal quickly without "walking." There's no need to dimple the drilling surface with a center punch first as required with conventional points.

Conventional and split-point twist drills both bore wood, but brad-point drills do it better (photo, top left). Brad-point drills have a diamond point that prevents walking and two spurs that scribe the circumference of a hole while chip lifters clear out the middle. The result is a round, splinter-free hole that is great for doweling or exposed work. Because they cut straight and clean, brad-point bits also work well for boring end grain or veneers. I've seen brad-point drills made of high-speed steel and of less expensive chromevanadium or carbon steel, all of which work fine for most wood-boring jobs. Fuller and Triumph sell high-speed steel ones that bore wood, plastic or thin sheet metal. Forest City makes carbidetipped ones for boring fine-grain hardwoods, laminates and other cabinet materials.

For clean boring through plastics and laminates, both Fuller and American Tool sell highspeed steel twist drills with 60° points, a lot sharper than the 135° split-points. The 60° angle helps prevent chipping at the exit point.

Other intriguing point designs on the market are the computer-designed Jet Point on Irwin's new TurboMax drill bit, the Speed Point on Vermont American's Sidewinder bit and the Pilot Point on Black & Decker's Bullet bit. All are designed to penetrate wood, metal or plastic quickly without walking. I recently tried out several TurboMax drill bits on pine and Douglas fir. They bored *fast*.

Auger bits bore fast and deep in wood

Today's auger bits (photo, facing page) are spinoffs of models developed in the 1800's for shipwrights, cabinetmakers and homebuilders. These big, prominently fluted bits are proficient chip ejectors, making them a good choice for boring deep holes in wood with minimal binding.

Auger bits are priced from about \$10 to \$100. The three distinct types-solid-center bits, hollowcenter bits and double-twist bits-all fit either electric drills, hand braces or both.

Solid-center bits are strong and accurate— Solid-center auger bits have a solid stem, one spiral flute, a screw point and one or two spurs and cutters. The lead screw pulls the bit into and



through the work, requiring little additional pressure to force the bit through. The spurs cut the circumference of the hole, allowing the cutters to lift shavings without splintering. This configuration also produces a relatively clean exit hole.

The pitch of the threads on the screw point determines the smoothness of the hole and the cutting speed. Bits designed for cabinet work usually have a fine-or medium-thread screw point plus two spurs and two cutters. Contractors' or electricians' auger bits have medium or coarsethread screw points for fast work, plus one spur and one cutter. A popular version with a sturdy, extra-wide outer edge, or land, is sold by Star-M and Irwin.

Solid-center auger bits have diameters ranging from about $\frac{1}{4}$ in. to $1\frac{3}{4}$ in., and lengths from about $\frac{3}{2}$ in. to 18 in. If you plan to run a lot of pipe or electrical cable through framing, an overall length of 6 in. allows most electric drills to squeeze between framing members yet bore through tripled 2xs.

If you're looking for a rugged auger bit that resists bending and bores smooth holes, solid-center auger bits are the best choice. Don't try drilling through nails with them, though, or you'll damage the spurs. Consider using hollow-center auger bits that are designed for this purpose.

Hollow-center bits are quick and dirty-

Shaped like a helix, hollow-center auger bits seldom clog. One type—the ship auger—typically cuts through nails and other foreign matter because it has a hardened tip and no spurs to break (check with the manufacturer to make sure a particular ship auger is nail-proof). The ship augers I've seen range in length from 6 in. to 18 in. and in diameters from about ^I/₄ in. to 2 in. Ship augers chew rough holes. This is fine for concealed work, but if you're boring, say, garage studs that will stay exposed, solid-center or double-twist auger bits will do a neater job.

Double-twist auger bits bore smooth holes-

Double-twist augers have two spiral flutes instead of one, with the twist itself forming the core of the bit. Sometimes called electricians bits (a term also applied to some solid-center bits), they have screw points and one or two spurs and cutters. These bits typically cost more than solid-center bits do, and they don't cut through nails as ship augers do. But many people believe that doubletwist auger bits are the smoothest, truest-boring auger bits available.

The double twists I've seen measure from 6-in. to $8\frac{1}{2}$ -in. long for boring between framing members, with diameters ranging from $\frac{5}{8}$ in. to $1\frac{1}{2}$ in. Those designed for use in hand braces are usually called Jennings-pattern auger bits. They are available in sizes as long as 8 in. and in diameters as large as $1\frac{1}{2}$ in.

Spade bits: Low-cost wood borers that drill fast but not deep

Spade bits (photo, p. 70) cost just a few dollars or less apiece; they bore holes quickly, they're easy to sharpen on site, and most even have a hole in them that allows you to hang them up or to pull wires. In the past few years, improved models have appeared without significantly raising the cost. And at least one new alternative is supposed to outperform traditional spade bits at half the cost of auger bits.

Because spade bits aren't fluted, they don't draw shavings out of holes as auger bits do. When drilling deep holes with spade bits, you have to pull them out frequently to remove the sawdust, or risk binding. Thus, these bits work best for drilling holes to about the thickness of a 4x. Also, spade bits don't have spiral lands to guide them through holes. If you veer in the middle of a hole, the spade will slap around like a flat tire. Bits are either 6-in, long or 16-in, long for extended reach (extension bars are also available). Diameters range from ¹/₄ in. to 11/2 in. for 6-inchers and from 3/8 in. to 1 in. for 16-inchers.

Spurred or spurless?—Before researching this article, I used spurless spade bits only They're easy to sharpen and can be ground quickly into custom bits.

Irwin introduced its Speedbor 2000 in 1985 as an upgrade to the standard spade bit. It has two spurs flanking the tip and is grooved below the leading edges to produce true cutters.

I recently bored some holes in a 2x4 with a 1-in. dia. Speedbor 2000 bit and with a ¾-in. dia. spurless spade bit chucked in my ¾-in. drill.

Despite its larger diameter, the Speedbor 2000 consistently bored faster. Other spurred spade bits have appeared on the market recently, including ones by Vermont American and Magna.

A self-feeding challenger—Unlike spade bits, Wood Eater bits (sold by Magna and Vermont American) have screw points that pull them through the work. They also have spurs for clean, splinter-free boring and, like all spade bits, hex shanks that won't slip in a drill chuck.

Wood Eaters cost about $2\frac{1}{2}$ times more than spade bits, but they're supposed to last seven times longer and bore holes three times faster. They're also supposed to bore with less effort. I bored several holes through a 2x4 with a $\frac{1}{2}$ -in. dia. Wood Eater. It bored fast and clean with little effort. Wood Eaters are 6-in, long, with diameters ranging from $\frac{1}{2}$ in. to $1\frac{1}{2}$ in.

Pipe-and-condult bits: Self-feeders that bore big holes through wood

Pipe-and-conduit bits (photo, facing page) bore holes as large as 4% in. dia. through wood framing fast enough to let electricians and plumbers get home for dinner. These bits are designed to fit ½-in. drills. Like spade bits, pipe-and-conduit bits



Self-feeding wood-boring bit drills big holes fast. Black & Decker's TimberWolf bit has replaceable spurs and cutters that are tough enough to bore through nails. These bits are popular with plumbers and electricians who can't always see what they're drilling into.

are fluteless, so they need to be withdrawn from deep holes periodically to clear chips. To save your wrists, the bigger bits should be operated in heavy-duty right-angle drills equipped with a clutch that slips if the bit jams.

Pipe-and-conduit bits are by far the most expensive wood-boring bits on the market. I've seen list prices range from about \$25 for the smallest bits to more than \$200 for the biggest. Street prices are significantly less.

Bits with teeth—Self-feed pipe-and-conduit bits bore knotty, nail-infested wood without a whimper. These multispur bits have a continuous ring of teeth that cuts a circle and one or two cutters that simultaneously bore it out. Replaceable screw points pull the bits through the work. Coarse-thread screw points work best for fast boring in softwoods, and fine-thread ones work best in hardwoods. Some bits have reversible points with fine threads on one side and coarse ones on the other. A few models even have replaceable shanks.

Self-feed bits measure from 5-in. to 61/4in. long, with diameters ranging from 1 in. to 4% in. And they're heavy. The big ones weigh more than $2\frac{1}{2}$ lb. Several manufacturers sell plumbers and electricians kits that include self-feed bits, assorted

screw points and even a taper file for resharpening, all packed into a sturdy plastic or metal case.

Replaceable cutters keep bits

sharp—An alternative to the multispur, self-feed bits is DeWalt's Industrial Joist and Stud Bit and Black & Decker's identical TimberWolf bit. These bits feature a lightweight aluminum cutterhead to which are screwed replaceable, hardened-steel spurs and cutters that are tough enough to bore through nails. A steel shank with a screw point on the end slips through the core of the cutterhead and is held fast with an Allen screw.

I couldn't resist trying out one of these beauties—a $2\frac{1}{8}$ in. dia. TimberWolf bit—on a Douglas fir 2x10 (photo, left). It worked well. Then I remembered to tighten the spurs and cutters. It worked even better. These bits come in diameters ranging from $1\frac{3}{4}$ in. to $4\frac{5}{8}$ in. List prices range from about \$32 to \$140.

Winged bits cost less, don't cut nails—Some pipe and conduit bits have opposing wings welded to a shank, with a razor-sharp spur and cutter on each wing. They also have replaceable screw points.

I tried one of these bits—a 1-in. dia. Lenox Wood Boring Bit—on a wellaged 2x4. It glided through the wood like a propeller through water, leaving a clean exit hole. Because the bit has spurs, it won't fare well if you hit a nail. However,

you can resharpen the blades and the spurs easily with a taper file. Lenox Wood Boring Bits come in diameters ranging from 1 in. to 4% in., and they cost about 27% less than the self-feed multispur bits sold by the same company.

Hole saws: Cut big holes in anything, but with a limited depth of cut

Like pipe-and-conduit bits, hole saws (photo, p. 74) often are used by the mechanical trades to accommodate pipe and conduit. They also are used for installing locksets in doors and dryer vents in walls. But most hole saws aren't limited to boring wood. Depending on the cutting edge, they'll drill anything you can imagine. Depth of cut, though, is limited by depth of hole saw. Hole saws don't bore wood as fast as pipe-and-conduit bits, but they are a lot cheaper. A Milwaukee 4³/₄-in. dia. bimetal hole saw plus the most expensive arbor lists for \$61.85, as opposed to \$184 for Milwaukee's 4⁵/₈-in. dia. Selfeed multispur bit.

Basic hole saws are a hassle—Until now, I thought all professional-grade hole saws were like my old ones. These bimetal saws have a hardened high-speed steel cutting edge welded to a tough, alloy-steel body. A threaded hole in



the bottom of each saw accepts a threaded arbor that has a replaceable pilot twist drill on one end and a shank on the other that gets chucked in a portable drill. The benefit of this system is that one arbor fits all of my hole saws. The drawback is that any time I switch saws, I have to break the arbor free from one saw, which can take effort, before I unthread it and rethread it. Also, once I'm done cutting a hole, I have to pry the plug out of the saw. It takes time and is unnecessary.

There are arbors that let you switch from one hole saw to another easily, and some even eject the plugs. Four types are worth a look. The simplest is the built-in arbor. It eliminates the hassle ofswapping hole saws and is relatively inexpensive, but you still must pry out the plug when you're finished drilling.

An alternative is the quick-change arbor. It threads onto hole saws as standard arbors do. But instead of tightening snugly against the bottom of the hole saw, which makes it a pain to get off, it's backed off a quarter turn or so, allowing a pair of pins in the arbor to engage a pair of holes in the bottom of the saw. The pins are extended into the holes by sliding a knurled ring forward on the arbor. When it's time to switch hole saws, you simply retract the pins and spin off the saw.

Some arbors are designed to eject plugs. With one type, you simply tilt the drill so that the hole saw jams in the hole, throw your drill into reverse and pull the trigger. The arborspins, and a collar on the arbor pushes out the plug. The hole saws for these arbors come in diameters as large as $2\frac{1}{2}$ in.

Perhaps the most versatile arbor on the market is the Lenox Quikijex (photos, facing page). Its retractable pins allow quick changes and eject plugs. After you cut a hole, you snap a knurled ring forward and restart the drill. This extends the pins into the core of the saw, pushing the plug out. These arbors fit 15% in. dia. and larger hole saws.

Bimetal beats carbon steel—A fancy arbor won't do you much good if you don't have the right hole saw for the job. For most residential work, bimetal saws are the way to go. Unlike cheaper carbon-steel ones pitched to do-it-yourselfers to cut wood, plastic and soft metal, bimetal hole saws cut an amazing range of materials, including nail-embedded wood, cast iron, stainless steel, copper, brass, bronze, aluminum and plastic. They also last about five times longer than carbon-steel hole saws do.

Most contemporary bimetal hole saws have four to six variable-pitch sawteeth per inch, which last longer and cut 45% faster with less vibration than uniform teeth on older hole saws. Three-in. dia. and larger hole saws should have extra-thick bottoms or be fitted with torque plates to minimize vibration or kickback.

Bimetal hole saws range in diameter from about $\frac{9}{16}$ in. to $6\frac{5}{8}$ in. (for recessed lighting). Cutting depths range from about 1 in. to $1\frac{1}{8}$ in. Some manufacturers use the term "deep cut" to indicate that a hole saw will cut through a stud.

Carbide and diamond tips cut abrasives-

Carbide-tipped hole saws last as much as 10

Sources of drill bits

Here's an abbreviated, annotated list of drill-bit manufacturers and suppliers that covers the gamut of builders bits. For an expanded list of manufacturers, consult the Thomas Register of American Manufacturers in the reference section of your local library. *-B. G.*

American Saw and Manufacturing Company 301 Chestnut St. East Longmeadow, Mass. 01028 (800) 628-3030 Makes Lenox power-tool accessories, including bimetal and carbide-tipped hole saws, heavy-duty plug-ejecting holesaw arbors and hole-saw kits and pipe-and-conduit bits.

American Tool Companies Inc. 301 S. 13th St., Suite 600 Lincoln, Neb. 68508 (402) 435-3300 Makes Irwin, Hanson and Unibit drill bits, assorted twist drills, including a special one for boring plastics and laminates; multispur, pipe-and-conduit bits; Speedbor 2000 spurred spade bits; and auger bits.

Black & Decker U. S. Power Tools, Industrial 701 E. Joppa Road Towson, Md. 21286

(800) 762-6672

Sells multispur, self-feed bits; TimberWolf pipe-and-conduit bits; assorted twist drills, including stubby-length and Bullet Pilot-Point bits; spurless spade bits; bimetal hole saws; and auger bits.

DeWalt Industrial Tool Company P. O. Box 158 Hampstead. Md. 21074 (800) 433-9258 Sells high-speed steel, titaniumnitride coated and cobalt splitpoint twist drills in metal cases. Also sells bimetal hole saws that bore all the way through 2x lumber and a pipe-and-conduit bit with replaceable spurs and cutters.

Greenlee Textron Inc. 4455 Boeing Drive Rockford, III. 61109-2988 (800) 435-0786 Offers a complete line of boring bits for the mechanical trades, including auger bits; pipe-andconduit bits; and bimetal, carbide-tipped and carbide-grit hole saws.

INSTY-BIT 3336 Idaho Ave. S. Minneapolis, Minn. 55426 (800) 426-2732 Sells quick-change drill chucks and brad-point or conventionalpoint hex-shank twist drills to fit the chucks. Also sells hex-shank, self-centering bits that are an alternative to vix bits.

Milwaukee Electric Tool Corporation 13135 W. Lisbon Road Brookfield, Wis. 53005-2550 (414) 781-3600 Sells bimetal, carbide-tipped and carbide-grit hole saws; pipe-andconduit bits; double-twist and hollow-center auger bits; spade bits; and twist drills.

Primark Tool Group 1350 S. 15th St. Louisville, Ky. 40210-1861 (800) 242-7003 Marketer of bits by Magna Professional Tools and Forest City: twist drills; auger bits; spade bits; plug-ejecting hole saws; pipe-and-conduit bits; Wood Eater bits; and industrial woodworkers bits, including brad-point drills.

Relton Corporation P. O. Box 779 Arcadia, Calif. 91066 (800) 423-1505 Makes a variety of heavy-duty, carbide-tipped hole saws that cut cast iron, tile, granite, wood, fiberglass, stucco and porcelain. Sells environmentally friendly cutting fluids, too, including a special formula for aluminum. Star-M USA, Inc. 2283 Ringwood Ave., Suite E-l San Jose, Calif. 95131-1717 (800) 447-7876 Imports high-quality Japanese auger bits, including extra-short models for cramped quarters.

The L. S. Starrett Company 121 Crescent St. Athol, Mass. 01331 (800) 772-3649 Makes hole saws, including a diamond-grit one.

Vermont American Tool P. O. Box 340 Lmcolnton, N. C. 28093 (704) 735-7464 Sells just about everything, including twist drills, spurred spade bits, hex-shank twist drills, bell-hanger bits and Wood Eater bits and production drilling systems that include quickchange drill chucks, screwdriver bits and counterboring twist drills.

W. L. Fuller Inc. P. O. Box 8767 Warwick, R. I. 02888 (401) 467-2900 Sells a variety of drill bits, including twist drills with 60° points for boring plastic and laminates, ship augers and pipeand-conduit bits.

times longer than bimetal ones. Depending on the type of carbide used and the configuration of the tip, they cut Formica, Corian, ABS, PVC, Plexiglas, fiberglass, ceramic tile, Masonite, asbestos substitutes, stucco, aluminum siding, marble, granite, porcelain, nonferrous metals, wood and plastics. Some cut ferrous metals, too. Relton's rugged Tub, Tile and Spa hole saw cuts tile, marble and granite. Diameters of carbidetipped saws range from about $\%_{16}$ in. to 6 in., and cutting depths from the thickness of 10-gauge sheet metal up to 2 in.

For extra-rugged work, consider using carbidegrit or diamond-grit hole saws, which have no teeth to break off. These saws will cut everything from slate to glass. Carbide-grit, recessed-light hole saws have diameters ranging from 4% in. to 6% in. to cut holes for installing specific lighting fixtures. These saws will cut plaster, stucco with wire-mesh backing, drywall and even various ceiling tiles.

Bruce Greenlaw is a contributing editor of Fine Homebuilding. Photos by Charles Miller, except where noted.



New hole saws make plug removal easy. With conventional hole saws it's often difficult to remove the plug of wood from the saw after cutting the hole. The Quickljex arbor, made by Lenox, has a pair of pins that advance to eject the plug once you snap the knurled ring forward and reverse the drill.

