



# Back Sharpening

By Ian Kirby

*Add another angle to your blade to expand your ability to plane difficult woods.*

**B**ack sharpening is nothing new. It has been practiced by machine and hand tool workers for as long as sharpening has been around. Simply put, back sharpening means putting a sharpening bevel on what is generally considered to be the sacrosanct flat face of the blade. I will confine this article to back sharpening the blades of hand planes and begin by establishing some of the geometry of the tool.

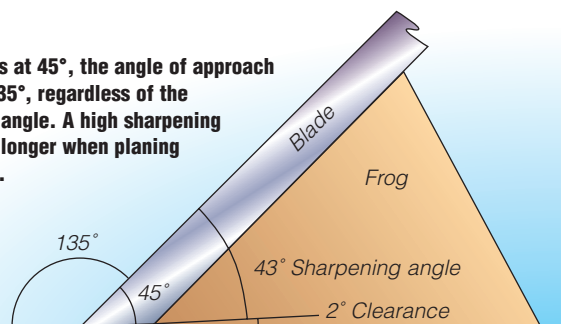
The blade and cap iron assembly sit on the frog. In the case of a metal plane, this slope is home to the

Y-adjusting lever and the lateral adjusting level, which together allow you to set the blade. The assembly is firmly held by the lever cap. In a wooden plane the assembly is held in place by a wedge and adjustments are made by tapping with a hammer.

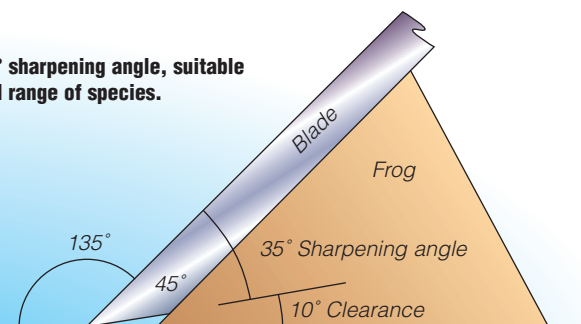
The differences between metal and wood planes are simply details. The essential similarities are that the frog is at an angle of 45° to the sole; the blade assembly is the same; the flat face of the blade, called the back, faces front; and the cap iron is positioned to turn the shaving and stiffen the edge of the blade.

*In the illustrations below, the blade is magnified to show angles more clearly; grinding angles are not shown. In a high angle plane, the back of the blade faces away from the Frog.*

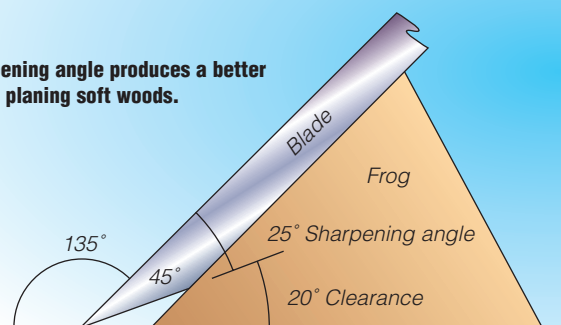
**If the frog is at 45°, the angle of approach is always 135°, regardless of the sharpening angle. A high sharpening angle lasts longer when planing hard woods.**



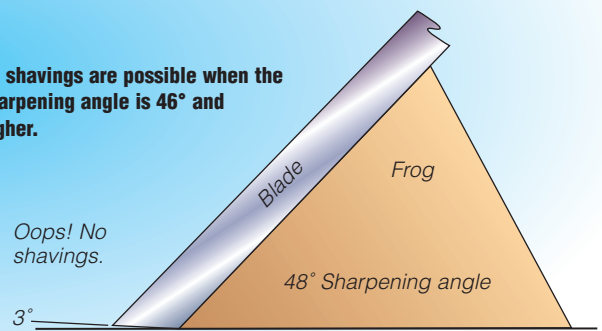
**Normal 35° sharpening angle, suitable for a broad range of species.**



**A low sharpening angle produces a better finish when planing soft woods.**



**No shavings are possible when the sharpening angle is 46° and higher.**



“It definitely looks small, but this back bevel will profoundly improve your ability to plane difficult wood.”

The 45° angle of the frog means that the maximum practical angle you can sharpen the blade is 44°. If it's sharpened 46° or more, the heel of the sharpened bevel rather than the sharp edge will contact the wood. In theory, there is no minimum sharpening angle, although less than 20° is impractical.

Sharpening at different angles will affect performance of the plane. 35° is considered the normal sharpening angle and it's good for most types of work, be it planing across the grain or with the grain.

It's also good for most species of wood. Not until you are presented with an extra-hard or an extra-soft wood is there a need to change the sharpening angle. Extra-hard wood could be hard maple, a parcel of unusually dense oak or a material like Gabon ebony. When planing harder species, you will get more life from an edge by increasing the sharpening angle to between 40° and 43°. Alternatively, if you are planing an unusually soft species such as white cedar, a sharpening angle between 25° and 30° will produce a consistently smoother surface.

In any case, the angle of the frog dictates a maximum sharpening angle.

As already noted, an angle of 46° or greater cannot work.

However, at whatever angle less than 44° you sharpen the blade, it will always present an *angle of approach* of 135° as it cuts the wood. That means that changing only the sharpening angle affects one part of the equation: as it turns out, the less effective part.

For the sake of completeness, and to illustrate the effect of varying the angle of approach, consider the block plane, also often referred to as a low angle plane. The reference describes the angle of the frog, which can vary from 12° to 20° depending on the maker of the tool. The essential differences between a block plane and a bench plane are that the block plane has no cap iron and its blade is positioned with the back face on the frog. The result is that the angle at which you sharpen the blade determines the angle of approach.

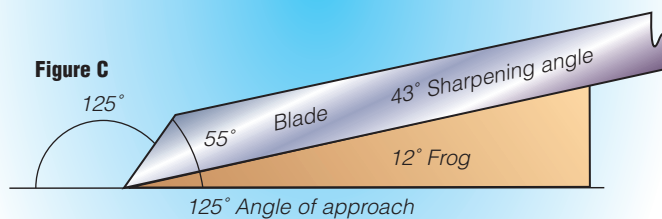
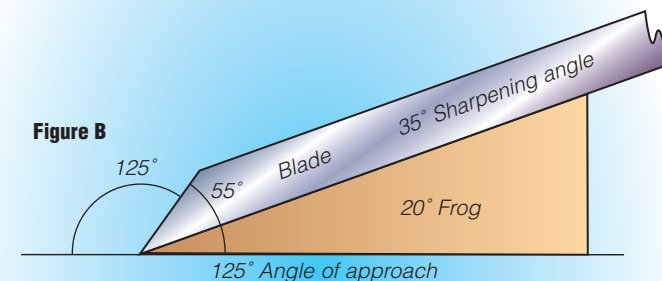
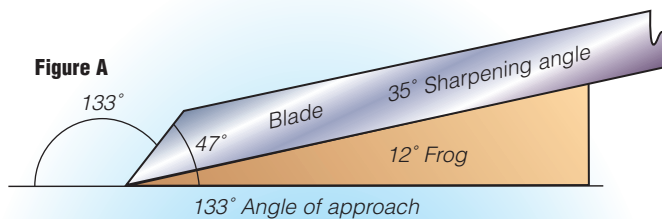
Let's assume that, as for a bench plane, you sharpen at 35°. When the blade is placed on a frog at 12°, the angle of approach is 133°. On a frog at 20°, the angle of approach is

125°. Both approach angles are steeper than the 135° angle of a bench plane. Since you can sharpen the blade at any angle you want, it begs the question: Why is there a need for different frog angles? For

example, if you sharpen at 43° and put the blade on a 12° frog, the angle of approach is also 125°.

In other words, whatever angle you sharpen the blade on a block plane affects the approach angle, which will considerably affect the cutting performance. By the same rule, if you change the angle of approach on a bench plane, the same is true, and you effect that change by back sharpening.

*In a low angle plane, the back of the plane faces the frog.*



**In the figures A and B above, the blade is sharpened at 35°. Figures B and C have the same angle of approach even though the frog in figure B is 20° and the frog in figure C is 12°. The difference is the sharpening angle, at 35° (Fig. B) and at 43° (Fig. C). Both approach angles, at 133° in figure A and 125° in figures B and C, are steeper than a bench plane of 135°.**

6 X 3/4 X 1  
25A80-H8VBE  
C332609 12/95

## Deciphering the paper label

- ❑ **6 x 3/4 x 1:** Wheel diameter, thickness and bore.
- ❑ **25A:** Grit type, the "A" indicates aluminum oxide.
- ❑ **80:** Grit size, the smaller the number, the coarser the grit and the faster the grinding operation.
- ❑ **H:** Bond grade or hardness, ranges from A (soft) to Z (hard). The soft end of the range wears away more easily, exposing new abrasive grit and producing less heat.
- ❑ **8:** Structure, the "8" designates the ratio of grit to bond on a scale of 0 (dense) to 12 (open). Open pores in the wheel's structure help clear the metal chips and contribute to faster and cooler cutting. Choose 8 for woodworking tools.
- ❑ **VBE:** Bond type, the "V" stands for vitrified, good for woodworking tools. "BE" modifier indicates a general purpose tool-grinding bond.
- ❑ **C332609 12/95:** Batch number and date of manufacture.

### To Back Sharpen or Not to Back Sharpen

The first point to emphasize is that if you are still struggling with a plane and you haven't got sharpening down, then don't expect that back sharpening is an essential must-know, must-use skill. It's undoubtedly something to aim for to exploit the full potential of this most useful of tools because it raises your level

of workmanship via a sharpening technique. Keep in mind, however, that before you get to race you have to be able to ride the horse.

Assuming your planecraft is up to snuff, you will realize that the first consequence of back sharpening is that it takes considerably more muscle power and grip to push and control the plane. The reward is that you can plane difficult grain that with a normally sharpened blade would have produced tearout, leaving a surface that needs a lot of sanding before it's ready to polish.

Not only can you plane the refractory areas without tearout, but they and the easy-to-plane areas will be as smooth as any surface I've ever seen come from a plane. Sanding with the finest grit paper wouldn't make it any better.

A couple of examples. Bird's-eye maple — the tissue is twisted up in pockets of small areas. A back sharpened blade will convert it to a smooth, flat surface with no tiny craters or tearouts, revealing colors and an almost iridescent surface. Interlocked grain of sapele or mahogany, sometimes called "striped" — the grain of one 3/4" wide band goes one way, the next 3/4" band

## Sharpening: a messy, sporadic job

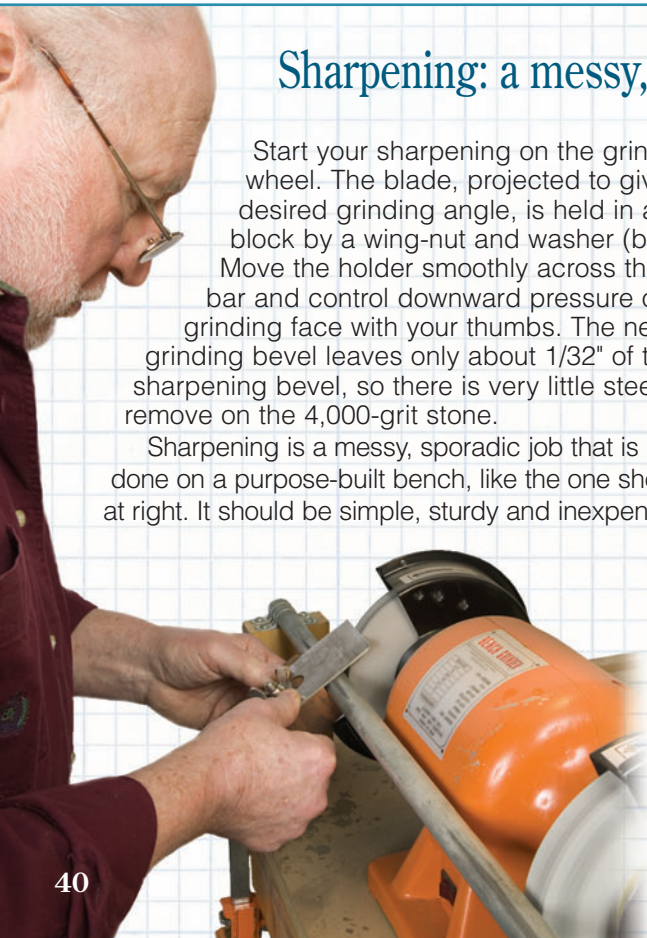
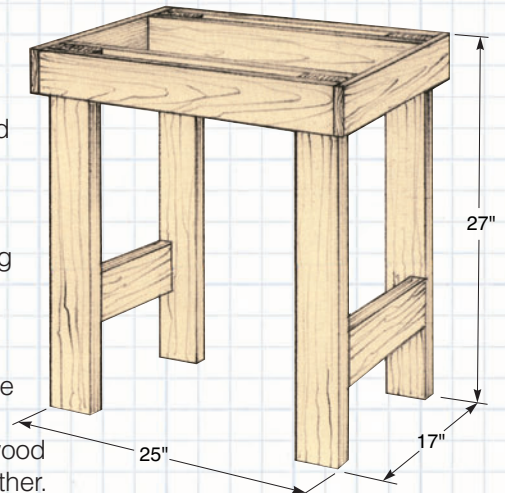
Start your sharpening on the grinding wheel. The blade, projected to give the desired grinding angle, is held in a wood block by a wing-nut and washer (below).

Move the holder smoothly across the steel bar and control downward pressure on the grinding face with your thumbs. The new grinding bevel leaves only about 1/32" of the last sharpening bevel, so there is very little steel to remove on the 4,000-grit stone.

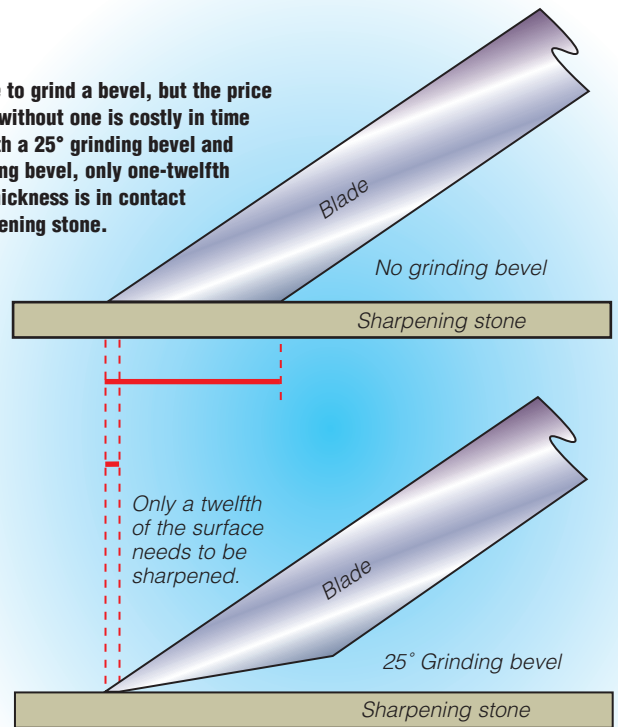
Sharpening is a messy, sporadic job that is best done on a purpose-built bench, like the one shown at right. It should be simple, sturdy and inexpensive.

It should stand at a height which allows you to make the sharpening stroke most efficiently. My sharpening bench is made of 2 x 4s and 1" x 3 1/2" softwood screwed together.

It is 17" wide, 25" long and 27" high. A plywood board, 3/4" x 14" x 14", with retaining strips fits between the top rails. On this rests a 14" x 14" piece of 1/4" plate glass, upon which I put wet and dry paper to flatten the waterstones. The stones are held between blocks screwed to the top edges of the frame. On the right goes a white Norton 4,000-grit waterstone and, on the left, a red Norton 8,000-grit waterstone.



You don't have to grind a bevel, but the price of sharpening without one is costly in time and effort. With a 25° grinding bevel and a 35° sharpening bevel, only one-twelfth of the blade thickness is in contact with the sharpening stone.



goes the other. The back-sharpened blade planes as if the grain were all going the same way. A small quartersawn oak panel with an annoying patch of grain going “the wrong way” — the back-sharpened blade takes care of it equally well.

### Sharpening and Back Sharpening

Sharpening is not woodworking; it's metalworking. Over the past few years, one person after another has introduced an “easy way” to sharpen. The reality is that, to be effective, one method isn't much easier than another. Different, yes, but developing sharpening skill demands the same requirements: sound information followed by practice. I'll describe the methods I use along with the pieces of equipment.

**Grinding:** The sole purpose of grinding is to make sharpening faster. A consequence of faster sharpening is ease and accuracy because less time is required to maintain the effort of blade grip and sharpening stance. Grinding is done on a wheel running at 1,800 rpm — half the normal grinder speed. The wheel is an 80-grit aluminum oxide abrasive held in place by a soft bond.

**Sharpening:** Because I use a 4½ and an 07 plane, the blade width is the same for both. I have about 16 blades, half of which are back sharpened.

**Back Sharpening:** Back sharpening is done on the same stones as normal sharpening. The sharpening angle is achieved with the aid of a block cut to a given gradient. The size of the sharpening bevel is less than 1/32", so it can be done with a few strokes on the 4,000-grit stone, then refined on the 8,000-grit stone.



Using a block of wood with a 35° slope, position the blade, remove the block, and grip the blade as shown at right. It's of no consequence whether the angle is a little more or less than 35°. What matters is that your stance — feet apart, body well-balanced and facing the stone — and grip maintain a consistent angle while you make the 8" reciprocal movement. Hold the blade close to the edge and apply even finger pressure across its width. Apply the same pressure as you move back and forth. The forward stroke is the more aggressive cut. It normally takes about 20 strokes to cut through the blunted edge. Beyond that, you are doing nothing but wearing away the grinding bevel and shortening the blade.



Keeping the same grip and the same angle of blade to stone, move over to the 8,000-grit stone to refine the sharpening bevel that you made on the 4,000-grit stone. It takes about as long to do this as it took to make the sharpening bevel. This stone is so fine that any burr that was raised on the 4,000-grit stone is removed, but “to make assurance doubly sure” you may choose to “back off” the blade by honing the flat face on the fine stone.



Edge from wheel

You can see how much metal is removed on the grinding wheel and how much on the grinding stone.

Edge from stone

# Sharpening is metalworking, not woodworking.



1. Use a guide to establish the desired back sharpening angle. There is no perfect angle suitable for all circumstances. It's entirely a decision that's made between you, the blade and the wood.



2. As in the example shown on the previous page, the first step is to use your block of wood to position the blade, setting the angle.



3. Remove the guide block and grip the blade in much the same way as you did to sharpen. It takes only four to six strokes on the 4,000-grit stone to cut the bevel.



4. Keeping the grip and angle, move to the 8,000-grit stone and refine the bevel. Because you are bearing down on such a small area, it takes only 10 to 12 strokes.

**Using the Plane:** There is no angle that I can offer as a standard. At this level of workmanship, you have to determine what works best for you. I suggest you begin with a 10° back sharpening angle. A 125° angle of approach isn't too radical, but there's no doubt it takes more effort to use the plane.

## Know Your Blade

All blades are not born equal. Different manufacturers make them in different ways. The earliest better blades were made with a piece of special steel fire-welded or brazed onto the flat back face. You could usually see this weld or braze on the edge of the blade. This special steel gave the blade a superior cutting edge.

As metallurgy advanced, larger manufacturers, such as Stanley in the USA and Record in the UK, replaced this method with a powder metallurgy process. Using this technology, a sintered material is applied to the bottom portion of the blade on the flat back side. In a controlled atmosphere at high temperature, the metal powders coalesce to form the hard, solid pad needed to make a cutting edge. It does a first-rate job, but the pad is relatively thin. When using this type of blade, you must keep the back-sharpened bevel very small. I don't see this as a constraint, because it should be kept small no matter the type of blade. Four to six strokes on a 4,000-grit stone is all it takes.

A blade by any other maker offers more material to work with, but I emphasize that a bigger bevel is unnecessary. Granted, the back bevel is small, but no matter how small it is, it will be still be visible when the blade is made blunt through use.

It definitely looks small, but there's no doubt that this back bevel will profoundly improve your ability to plane difficult wood.

*Ian Kirby is a master woodworker and regular contributor. For a complete sharpening guide, check out Ian's book, Sharpening with Waterstones, available from Linden Press.*