

# Grind Perfect Edges Without Burning

In just seconds,  
get a tool ready  
for honing

BY JOEL MOSKOWITZ

## When to grind

### AFTER REPEATED HONING

As you continue to hone an edge, the flat area grows larger and soon you are laboring to hone almost the entire bevel with very fine abrasives. This is a waste of time, and wears your sharpening stones unnecessarily.

### REPAIR DAMAGE

Grinding is also essential when a tool is damaged, with a deep nick or chip in the edge that honing can't handle, or a burned area.

### CHANGE THE BEVEL ANGLE

Sometimes you'll need to change the geometry of an edge, creating a steeper or shallower bevel angle.





# Setup is critical

## REPLACE THE WHEEL AND CROWN THE EDGE

Moskowitz recommends a 60-grit Norton 3X blue grinding wheel, a high-grade “friable” wheel that runs very cool. And he uses a multi-point diamond dresser to maintain a slight belly on it, which is one of the keys to his grinding technique.

For years, I dreaded grinding a new edge on tools, and generally put off the task until the need was critical. I had trouble keeping the edge from burning, and the process was time-consuming. Consequently, most of my tools were in sad shape.

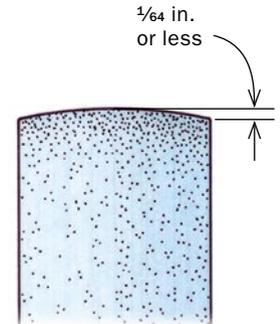
But two visitors to my shop changed all that. One was a friend from an abrasives company who made fun of my old gray grinding wheels and taught me a bit about wheel technology. After I had replaced my wheels with cooler-running, modern ones, my second visitor was Barry Iles of Ashley Iles Edge Tools. Barry has been forging and grinding edge tools since he was 14, and so I asked him to try out my much-improved wheels. First he took off my fancy tool holder, leaving only the basic tool rest. Then he turned on the grinder and dressed the wheel with a slight crown. About 10 seconds later, he handed me back a perfectly ground chisel.

It took Barry only five minutes to teach me his technique, and the rest was a little practice. I was amazed. Now I hollow-grind chisels, plane irons, and all other edge tools lightning-fast, easily, and without any trepidation. Here’s how I do it.

### Why a bench grinder?

Bear in mind that we are talking about grinding here, not honing. Grinding is done with rougher abrasives in order to quickly establish a fresh, clean bevel. Honing is done with much finer abrasives, to create a truly sharp edge.

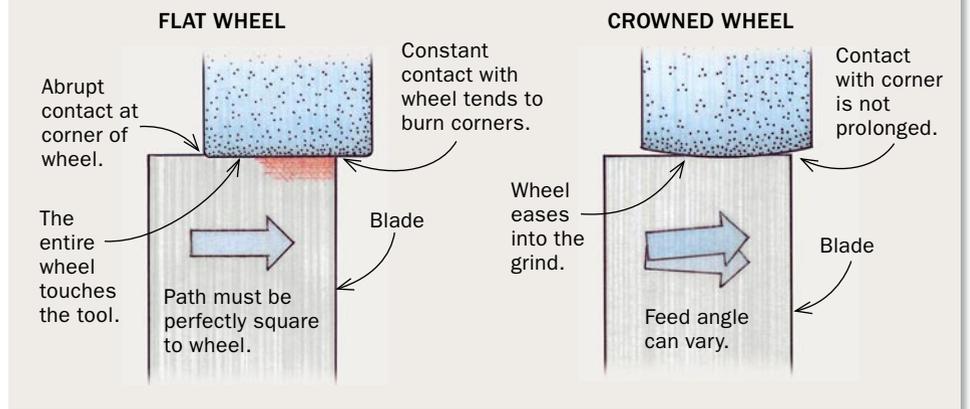
Although there are many grinder options on the market, my own preference is for a basic 6-in. bench grinder, the high-speed, dry-wheel type that runs at about 3,600 rpm. “Slow-speed” bench grinders are OK, but you should realize that an 8-in. version will have close to the same surface speed as my 6-in. model, despite the higher rpm, and surface speed is what it’s all



**Dressing is easy.** Once the grinder is up to speed, lightly touch the dresser to the wheel, and its surface will clean up quickly. At the same time, contour the wheel to a very gentle crown.

### THE BENEFITS OF A CROWNED WHEEL

The crowned wheel ensures that you don’t overgrind the corners, which are prone to burning, even if your side-to-side motion isn’t completely square to the wheel. With the wheel dressed properly, you’ll always know where you are grinding, and how heavily.



about. Definitely do not buy a high-speed 8-in. grinder; it will burn tools for sure.

As for the benchtop wet grinders, they are simply too slow for my tastes and a lot more expensive than a dry grinder. I don’t need all the fancy jigs either. For this technique, all you need is a solid, flat, adjustable rest. This can be the stock rest that came attached to the grinder, or an aftermarket rest that clamps to the bench.

Last, I’m not a big fan of flat grinders, such as sandpaper platters. They are expensive, and worse, they deliver a flat bevel. I prefer to do freehand honing, which is

faster than using a honing jig, and a hollow bevel (from a round wheel) makes it easy to rock the tool on the sharpening stone to find and maintain the bevel angle.

### Wheels that run cool

Almost all edge tools, except lathe tools, are made of tool steel that will lose its hardness if heated over 400°. This is known as burning, and when it happens the edge will first turn straw-colored (not bad), and then quickly blue (bad).

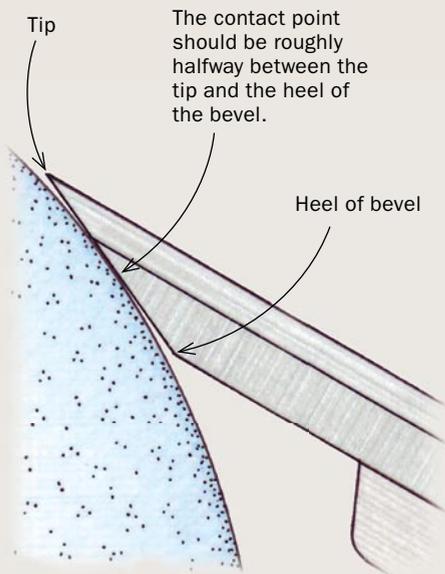
Wherever a tool touches the grinding wheel, particles of abrasive smash into the

# Touching up a bevel

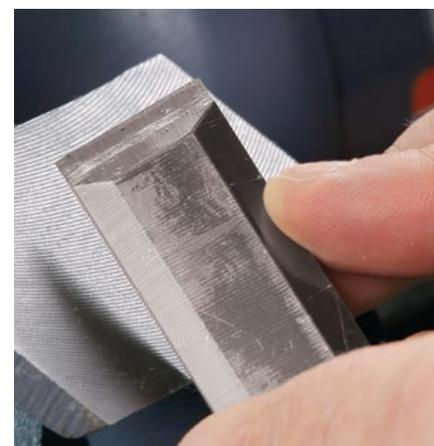
The most common task is refreshing an existing bevel, where the overall bevel angle is fine but the honed area is just too large.

## MATCH THE ANGLE

**First, eyeball it.** With the grinder off, lay the chisel flat on the rest and see where the bevel touches the wheel. Adjust the tool rest so that the contact point is in the middle of the bevel (see drawing below).



tool and rip off anything in their path. The process generates lots of friction and heat, so much that the tiny particles of steel burst into flame in a shower of sparks. Most of the heat is lost in the sparks, but some of it goes into the tool (and wheel). That's where grinding goes wrong for most people. They don't know how to minimize that heat in the first place or manage it when it happens, and edges quickly turn blue.



**Then check the scratches.** With the grinder still off, hold the chisel against the tool rest and rub the bevel back and forth across the wheel (left). You'll know the tool rest is adjusted properly when the scratches are centered on the bevel (right). If the scratches are too hard to see, scribble on the bevel with a pencil, and scratch the steel again.

Successful grinding starts with the wheel itself. The sharper the abrasive, the easier it will remove steel, and the less friction and heat it will generate. Unfortunately, like any cutting tool, the abrasive particles get dull. The solution? An abrasive wheel that either stays sharp indefinitely—impossible—or one that renews its abrasive surface. So abrasive companies have developed a binder—the stuff that holds the particles together—that weakens and breaks with heat and shock. As the abrasive grit in the wheel gets blunt, the impact increases, the heat builds, and the binder releases, exposing sharp, new abrasive grit. Wheels that shed their dull abrasive as they run are called “friable” wheels.

The first friable wheels were white aluminum oxide, but technology marches on, and Norton, for example, has introduced seeded-gel (SG) wheels under its 3X line. SG wheels use a ceramic abrasive particle that itself will fracture so you don't have to wait until the entire particle gets pulled away to expose a fresh edge.

### The crown is the key

The right wheel is critical, but that won't guarantee cool grinding. The single most important thing Barry Iles taught

me was to dress the wheel with a slight crown. There are several compelling reasons why.

With a flat grind, you can't predict where the blade will first touch the wheel unless you are perfectly square with the wheel (impossible to do freehand). Also, you can easily burn the corners of the edge as you are concentrating on grinding the center part. For reasons I'll cover shortly, the tip and the corners of the bevel are vulnerable to overheating and burning.

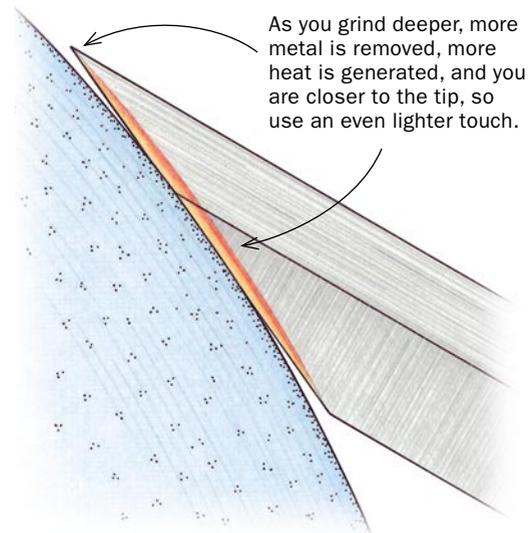
With the wheel crowned, however, it's easy to maintain control: Even when you approach the wheel out of square, you will ease onto the corner of the blade. And because I can easily control where I am grinding, I can take the pressure off the corners as I am grinding at the center.

Also, a clean wheel cuts much cooler than a wheel clogged with steel particles and dull abrasive. Even friable wheels clog over time, so no matter what kind of wheel you use, you'll need to dress it. And a bellied, or crowned, wheel is critical to this technique, and the wheel dresser handles that, too. Dressing a wheel is easy, but make sure to wear safety goggles and a dust mask. Redress the grinding wheel whenever it seems to be cutting

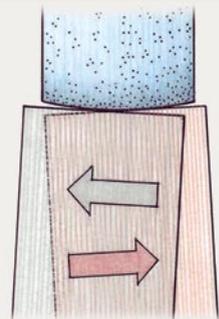


## A COOL GRIND

**Easy does it.** Use a light touch and keep your fingers close to the edge to feel the heat building up.



### TIP



By skewing the blade slightly with each pass, you can avoid running its vulnerable corners into the hard corners of the wheel.

slower, when there is a gray accumulation of steel on it, or when the crown is flattened.

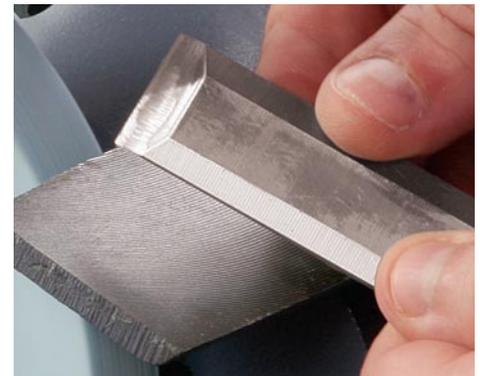
Another key to minimizing heat is to grind with a light touch. If you lean on the tool to try to speed things up, the abrasive can't cut it fast enough, the steel rubs, and the edge overheats quickly.

Your fingers are your heat sensors. Keep them only ½ in. or so from the edge, so you can feel the heat building. Put a full cup of water near the grinder. When the tool gets warm, dunk it into the water to cool it. One important rule is to first dunk the tool, then look at the edge being ground. If the tool is hot, the tip can burn in the time it takes to lift the tool and look at it.

The last part of the puzzle is giving the heat a place to go. Here's the theory: If you grind a thick chunk of metal, the heat will dissipate safely, but if you grind a thin section, the heat remains concentrated and the metal burns. What this means in practice is that you should always start grinding away from the very tip (and the corners) so the heat can dissipate into the thick part of the tool. As the hollow deepens, you will reach the tip, but only at the very end of the process.



**Dunk when you feel the heat.** The edge will heat faster as the new bevel gets closer to the tip. Have a can of cool water close at hand.



**Spot check along the way.** Keep a constant eye on the bevel as you grind. The widening hollow-grind should approach the edge evenly.

### Let's grind a chisel

Let's begin with the most common situation: a chisel or plane iron that has the right bevel angle but just needs a new hollow grind. It will be easier to practice on a thick bench chisel than a thinner plane blade, and a wider chisel will be easier to keep cool than a narrow one. I'll assume that the back of the chisel has been flattened already, at least near the edge.

Use the existing bevel to set up the tool rest (see facing page). Before grinding, though, be sure to have a pot of water right near the grinder, and don your goggles. Place the blade flat on the rest and advance it lightly into the wheel. First just touch the tool to the wheel, remove the



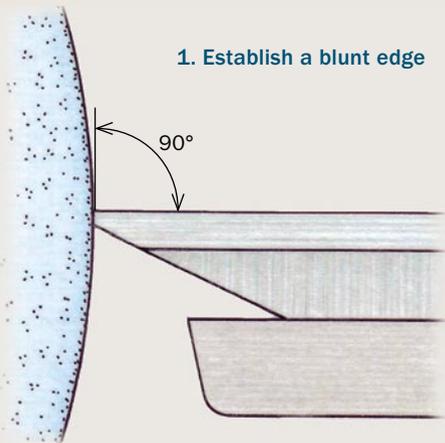
**The last pass.** The job is done when the grinding marks reach the edge. You'll know you're there when you feel a continuous, fine burr along the back. Stop right away to avoid overheating the tip. The edge is ready for honing.

# Grinding a new bevel

If a bevel is damaged or the angle is too shallow, you'll need to do some heavier grinding, and a new approach is needed.

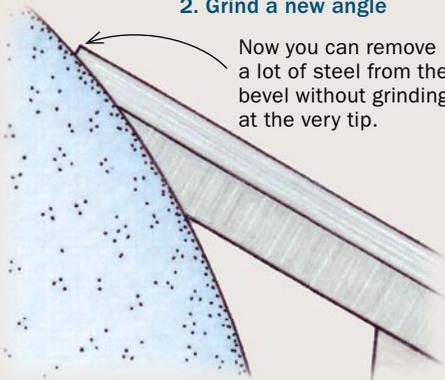
## TWO-STEP PROCESS

### 1. Establish a blunt edge



### 2. Grind a new angle

Now you can remove a lot of steel from the bevel without grinding at the very tip.



## CREATE A THICK EDGE

**Reset the tool rest.** Start by setting the tool rest square to the wheel. If you have a two-wheeled bench grinder, you can use the lower-grade wheel for this task.



**Lay out the new edge.** Use a square to mark a line for the tip of the new bevel.



**Grind to the line.** Use a light touch, dunk the tool often, and work back to the line.

tool, and confirm that you are cutting at the center of the bevel.

The key is to let the wheel do the work. With steady, light pressure, move the tool across the slightly bellied center of the wheel. When you are just starting to grind, you are grinding in the middle of the bevel, and the heat will easily dissipate into the body of the tool. I stop a bit short of the corners of the bevel at this point, and I check my progress by looking at the hollow grind forming on the bevel. Since you aren't using any jigs, it is easy to pick the iron up and see where you are. I initially try to get an even grind, while staying about  $\frac{1}{64}$  in. from the corners. Then I finish the entire edge with light passes from corner to corner. As you get closer to a full hollow grind, the wheel will be

grinding deeper and deeper into the tool (see the drawing on p. 65). This generates a lot more heat. Also, as you near the tip of the tool, the heat has no place to go. So slow down, use less pressure, dunk the tool more frequently, and keep using your fingers as a temperature gauge. Keep checking the bevel to see if you are removing material evenly. An even, light pressure, with a nice show of sparks, shows that the metal is being cut properly. Resist the temptation to rush near the end, and stop right away when the hollow-grind reaches the tip and a rough burr forms on the back.

### Damaged edge needs heavier grinding

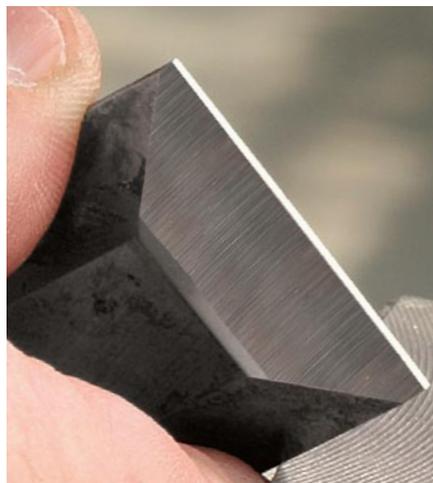
When a tool gets nicked or burned, the only way to repair the damage is to grind

past the problem. The trick to this is first to set the grinder rest  $90^\circ$  to the wheel and grind a blunt, square edge. This gets you beyond the vulnerable tip quickly and into a thicker section. It also gives you a good reference surface for regrinding the bevel. Stop when you are well past the damage. Grind the blade as square (side to side) as you can, but don't sweat any minor inaccuracies. These will be removed in the honing process.

Now you'll have to reset the tool rest to the desired bevel angle. If there is not much of a bevel left at this point, use an iron already ground to the desired angle to set the tool rest, or use a wood or cardboard template as shown on the facing page. Of course, if you have two wheels on your grinder, you can square

## RESET THE REST AND GRIND THE BEVEL

**Reset the tool rest accurately.** One method is to use a tool already ground to the desired angle. If you don't have one handy, you can use a simple cardboard angle gauge as shown. Twenty-five degrees is a common angle for bench chisels and plane irons.



**The blunt edge is your guide.** If you keep an eye on that edge as you grind, you'll know you are removing material evenly on the bevel, and you'll have near-perfect results. Honing will take care of slight inaccuracies. You're done when the blunt edge disappears and you can feel a burr on the back.

up on one wheel and maintain the bevel angle on the other tool rest. This time, check the squared edge of the tool to be sure you are grinding an even bevel. It is that simple.

**Changing an angle: Shallower or steeper?** If you need to change an existing bevel angle, the simplest situation is grinding a shallower angle (longer bevel). Here you will be grinding safely at the fattest part of the bevel, the heel. But if you need to make the bevel steeper, you'll first need to grind a blunt, square edge to the tool as when repairing damage. Otherwise you'll be doing some prolonged grinding at the tip, and you'll definitely overheat the metal. After putting a square grind on the tip, reset the rest to the new bevel angle and proceed.

### Curved tools are a cinch

This technique of first grinding a square edge will help you grind an even bevel on curved tools, too, from a scrub-plane blade (see top right) to carving and turning gouges.

That's it. It's not brain surgery. There is no need for special jigs, no need for complicated setup. Practice helps, and with a tiny bit of mastery you will be able to do what craftsmen have been doing for centuries—walk up to a grinder, set it up in seconds, grind what's needed, and get back to work. □

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## Curves are easy



**Start square again.** For a scrub-plane iron, for example, simply lay out the desired edge profile, and then set the tool rest to 90° and grind to the line.



**Use the square edge as a guide.** Reset the tool rest to the bevel angle, and pivot the iron to follow the curve as you grind (left), using the blunt edge to track your progress (below).



**Ready for honing.** With a bit of practice, you'll be grinding smooth bevels in seconds, whether flat or curved.

