

Tool Geometry And the Cutting Edge

By Lyndal Anthony

Photography by Joan Overhouse

"Insanity is doing the same thing over and over again but expecting different results."

Quote first appears in the book "Sudden Death" by Rita Mae Brown

Number one rule:
Rub the bevel!

The bevel not only guides the cut,
but it supports the tool during the
cut.

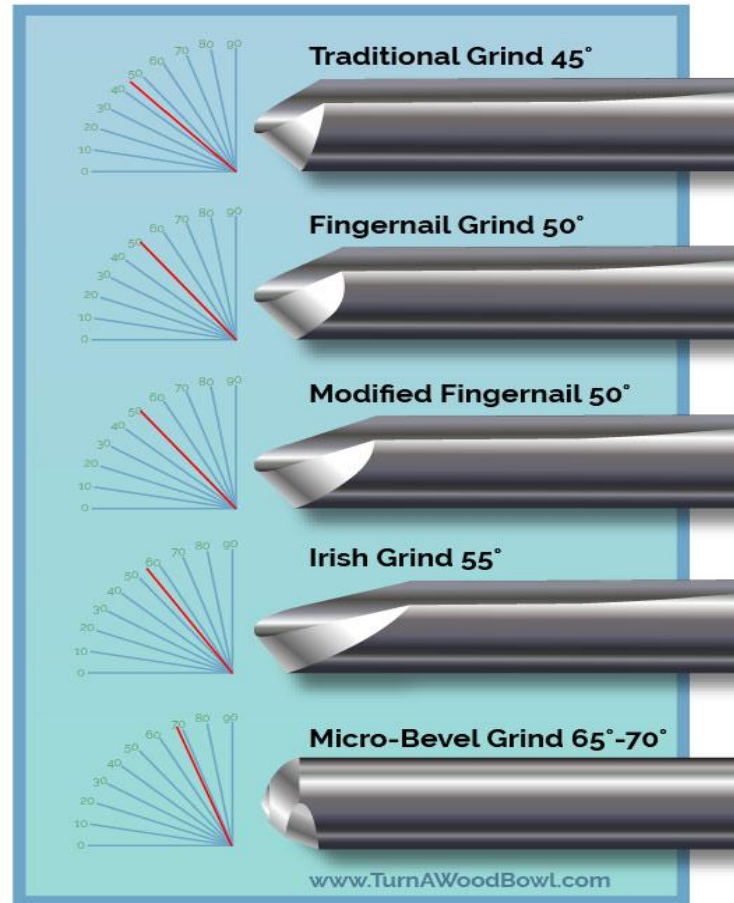
Number two rule:

Take very thin cuts with a sharp tool! Don't hurry. Take your time and do it right.

Have you noticed how cleanly a skew chisel cuts? Why?

A skew chisel has a thin knife edge and is used by lining up the cutting edge WITH the rotation of the work piece.

What grind angle is the best?



Knives or tool:

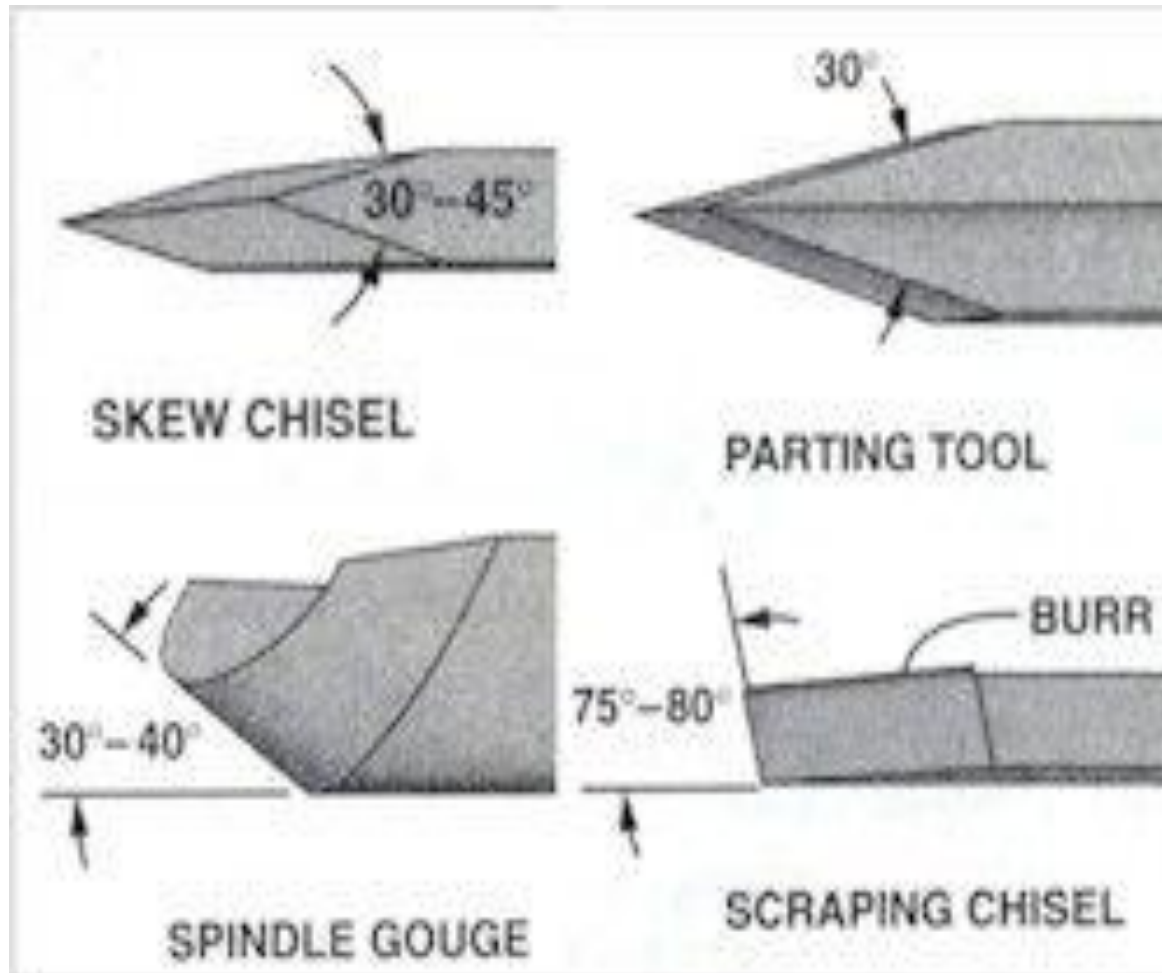
Type of Knife or Tool	Recommended Angle
<ul style="list-style-type: none">• Cleaver• Machete	30 - 35 Degrees
<ul style="list-style-type: none">• Hunting Knives• Pocket Knives• Survival Knives• Sport Knives	25 - 30 Degrees
<ul style="list-style-type: none">• Chef's Knives• Kitchen Knives• Smaller Knives• Boning Knives• Carving Knives	18 - 25 Degrees
<ul style="list-style-type: none">• Fillet Knives• Paring Knives• Razors• X-Acto Knives	12 - 18 Degrees

What this demonstrates is that there are so many angles that work depending on where and how they are used, there really is no “perfect” angle.

Stuart Batty 40/40 Or the Ellsworth Grind?

What I have observed is;
the best angle is what
you get used to. It is not
an absolute.

Spindle Gouges



Sure is confusing isn't it?

It boils down to this: It is mostly what you are used to balancing where it is going to be used and how tough you want the cutting edge needs to be. The more blunt the cutting edge is, the longer it stays sharp, but the more extreme the angle, the better to get into narrow cuts and the more slicing capability it has.

So, what is the perfect angle? It depends on who you talk to or what you are used to. Think of the different angles on axes, knives, carving chisels, hand planes and/or wood chisels.

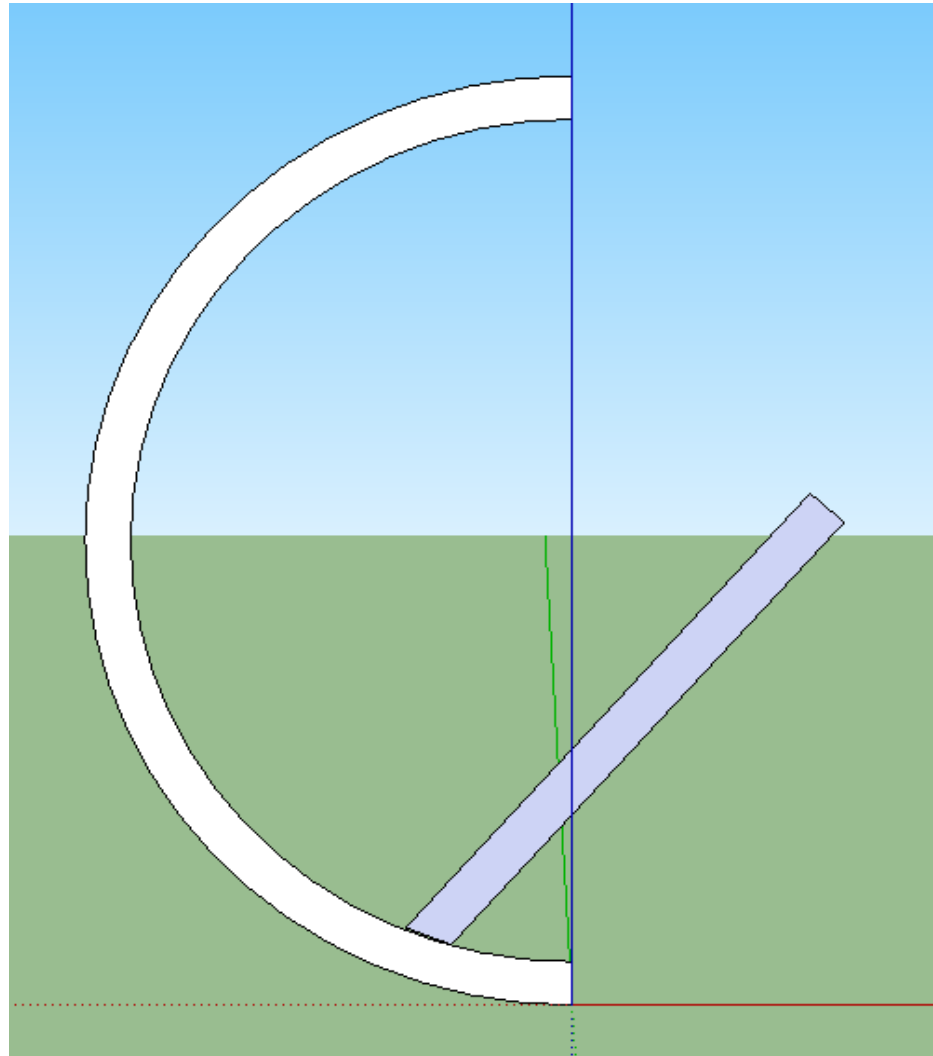
To me, it makes sense that the sharper the cutting edge/angle, the more effective the cutting action, but other factors have to be considered.

For one thing, the sharper the angle, 15° versus 30° means that the sharper angle will dull more quickly

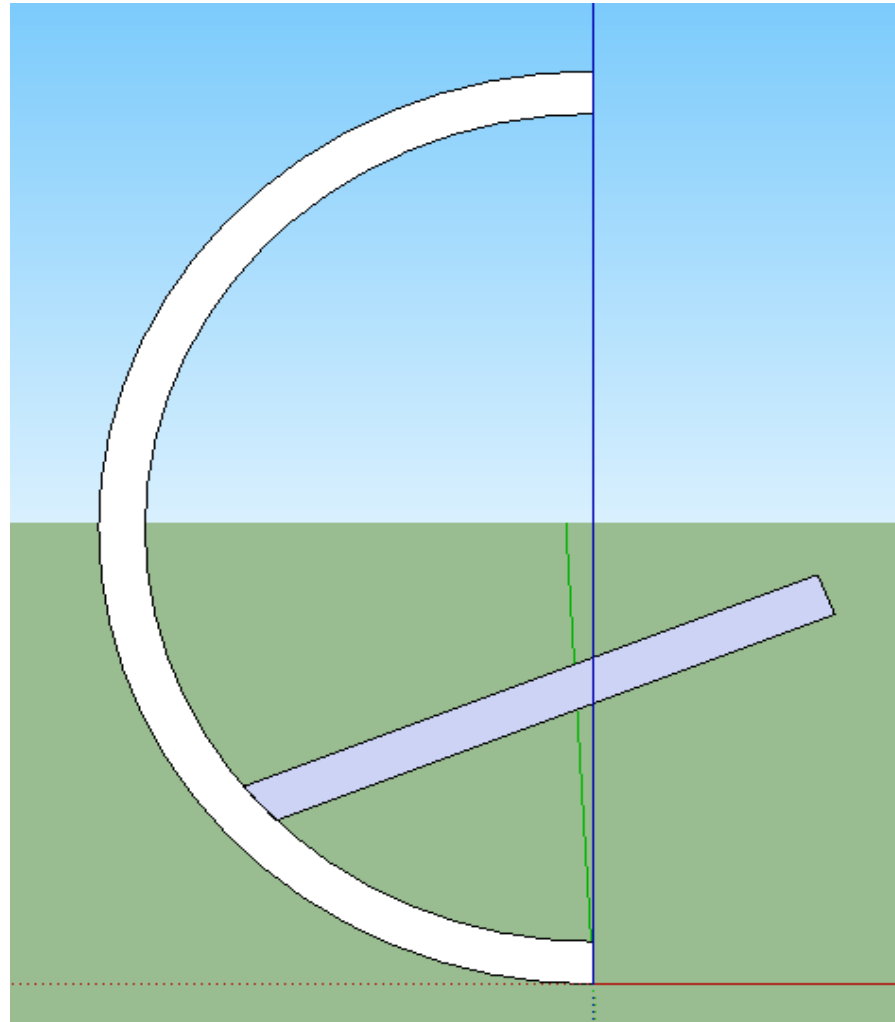
Why is the bevel angle different with a spindle gouge than a bowl gouge?

It has to do with where the tool is used. The steep angle of a spindle gouge won't work on the inside of a bowl because the tool will run into the side of the bowl before it gets to the bottom forcing the cut to cut OFF the bevel.

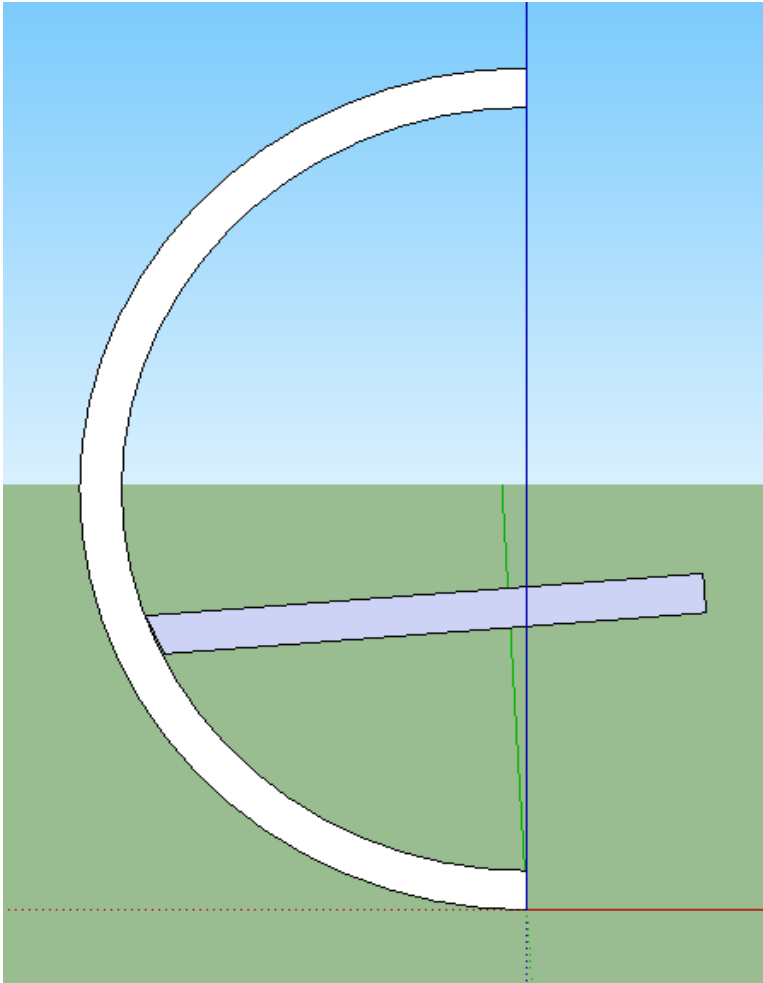
Bowl gouge with 30° Nose angle



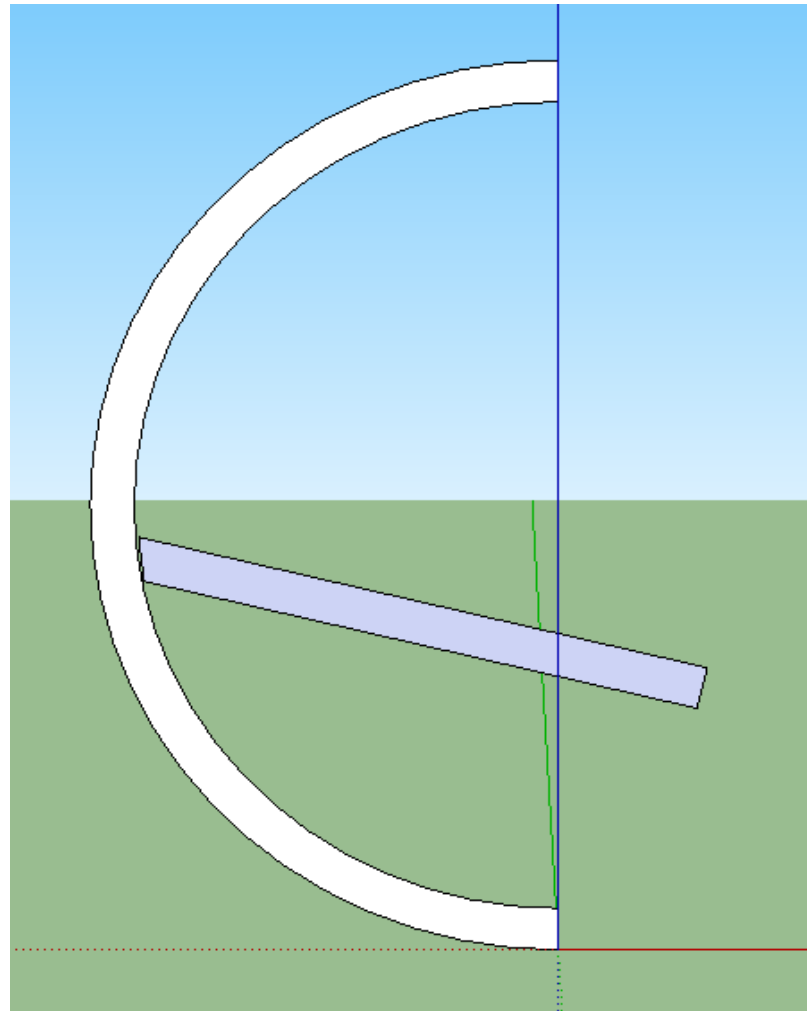
½ way through the cut. Notice that the tool is well away from the side of the bowl



Notice that the tool is still well away from the side of the bowl

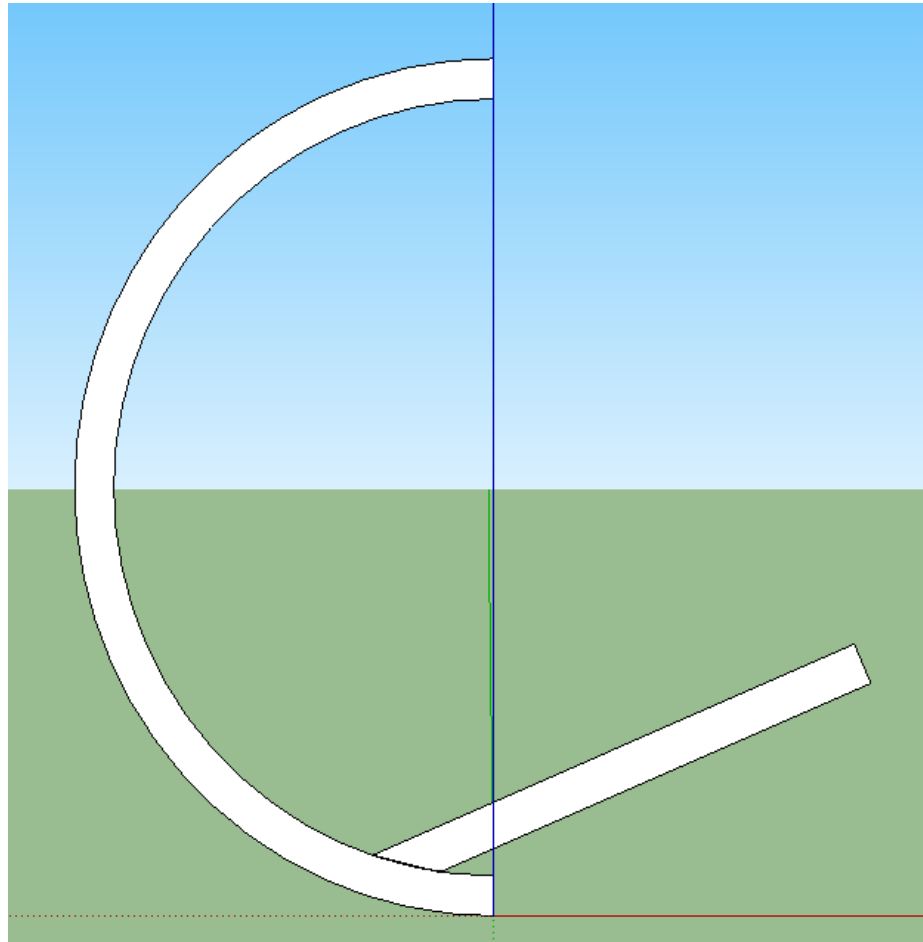


The cut is almost complete and the tool is still away from the side of the bowl

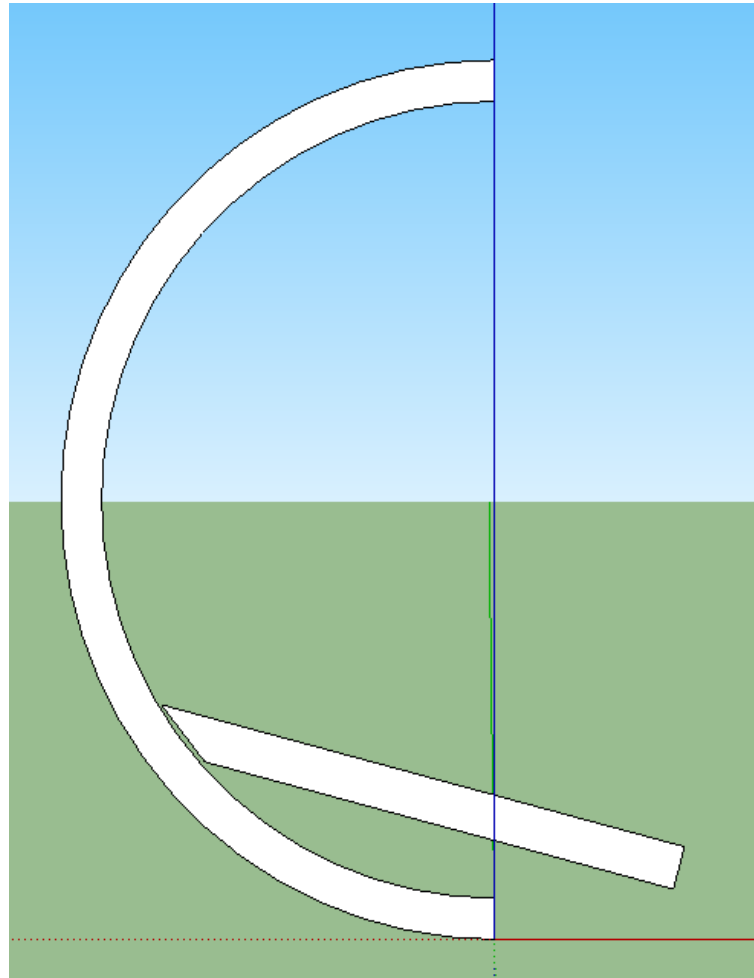


Notice that the tool clears the sides of the bowl all the way to the bottom

Now a tool with a 60° nose angle

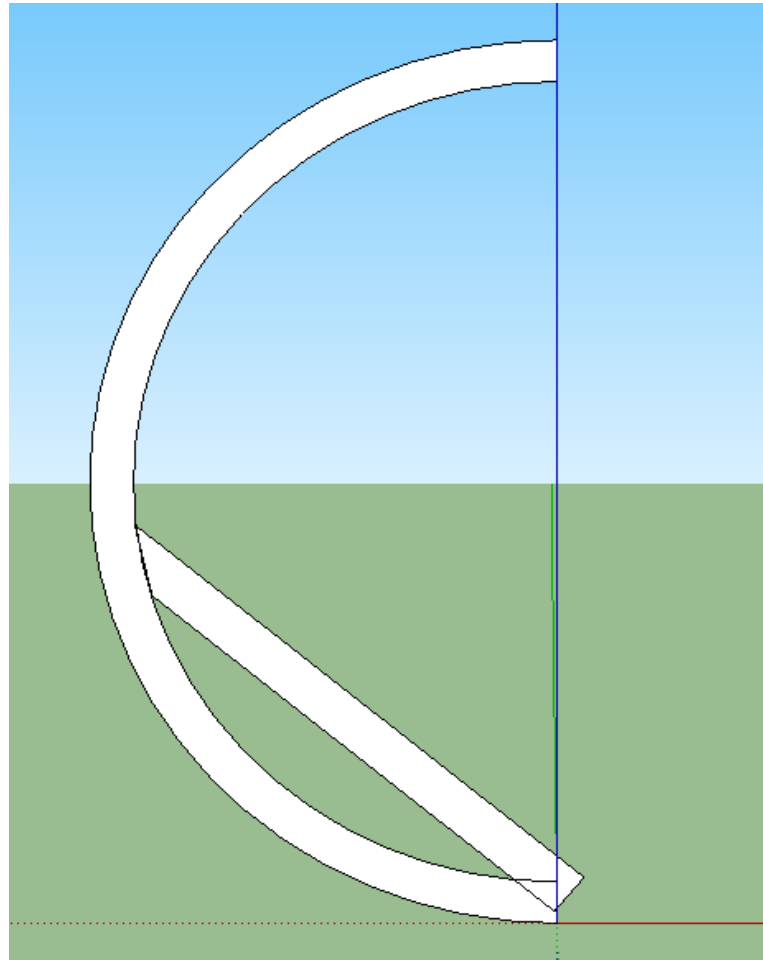


The tool is $\frac{1}{2}$ the way through the cut and notice how close it is to the side of the bowl



Notice how the angle of bevel is so steep it gets close to the side of the bowl, then at the bottom, the gouge runs into the side of the bowl.

Now the tool is almost to the bottom of the bowl and is rubbing the side of the bowl. It can not complete the cut



The nose angle of a bowl gouge is usually around 30° to 45°

But the angle of the wing, sometimes called the “cheeks” cutting edge can be as slim as 25° or so, just like the difference between a splitting maul and an axe.

Bevels!

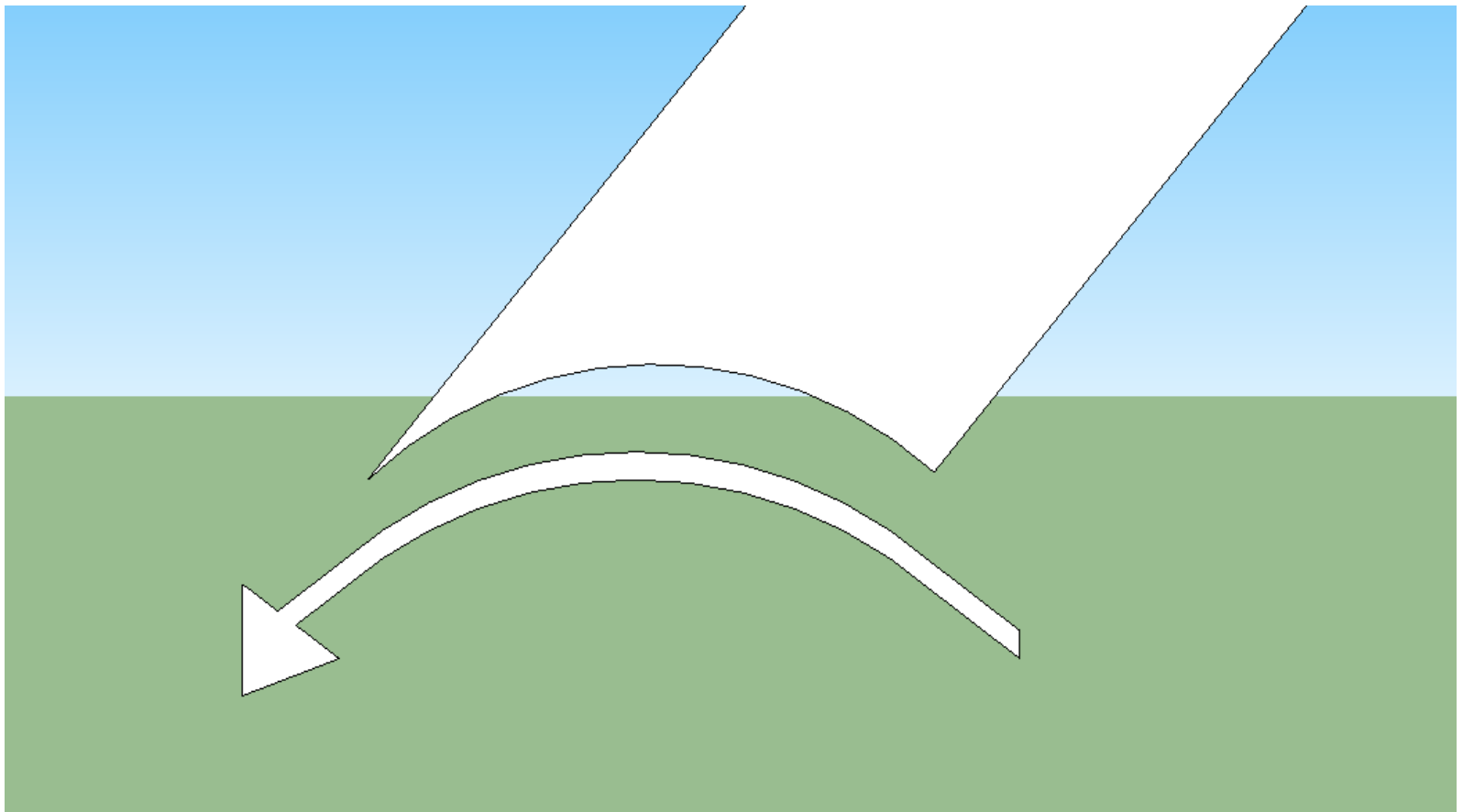
There are three the types of bevels

A. Hollow ground/concave

B. Flat

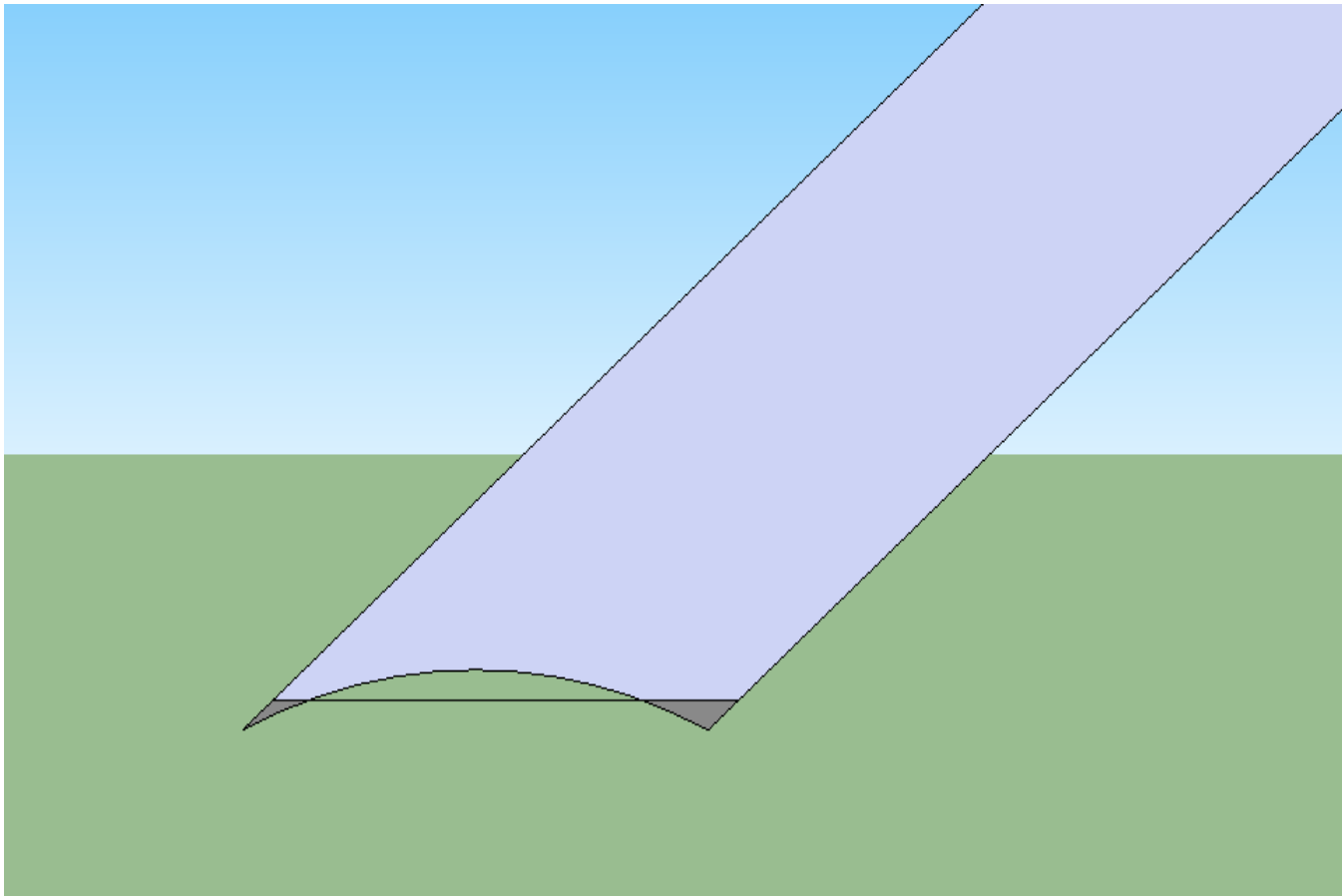
C. Convex

(Exaggerated hollow grind bevel)
Notice that the hollow grind wants to follow a radius into the work piece.

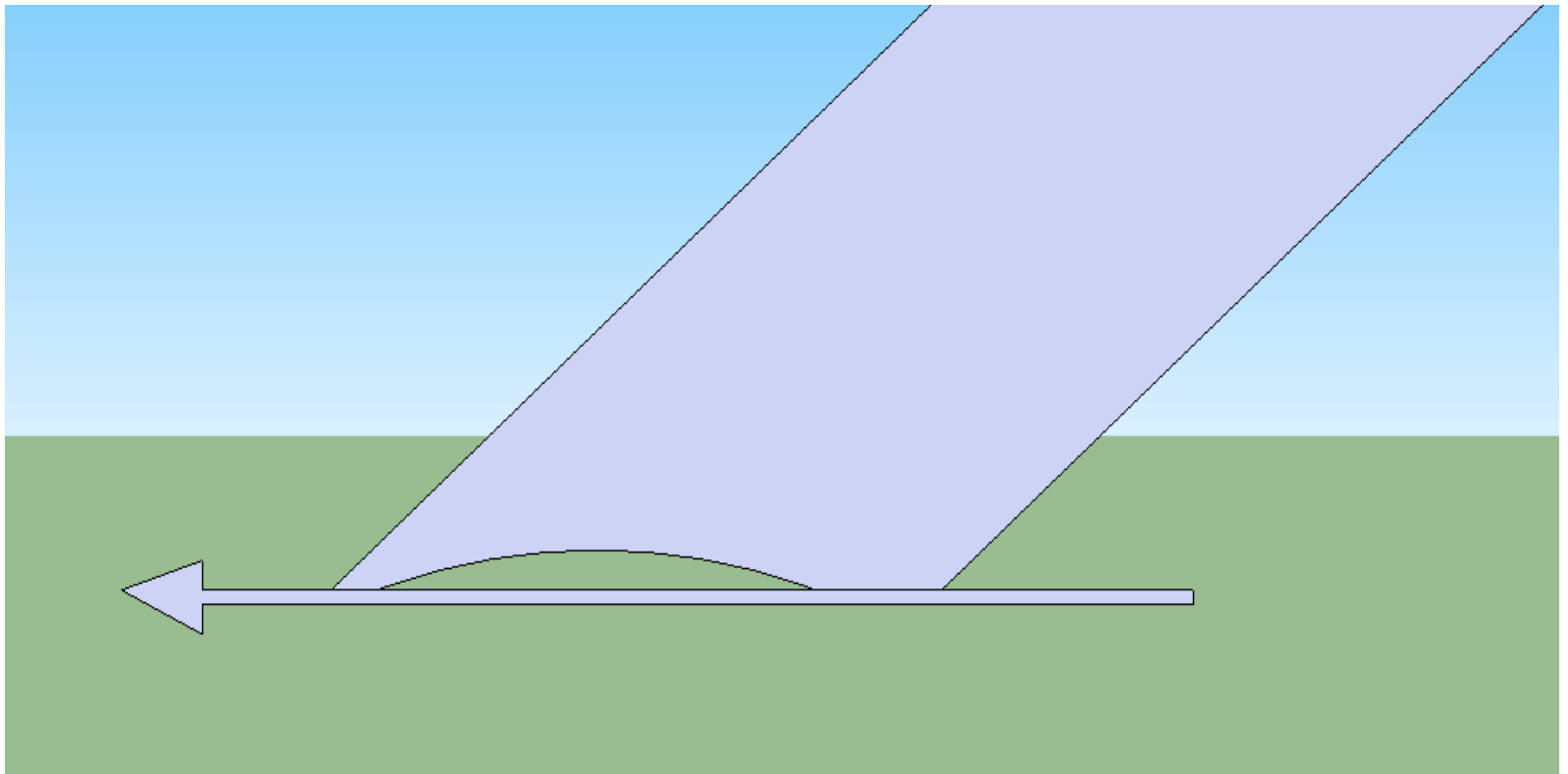


It locates on two points, the cutting edge and the heel of the bevel which helps stabilize the tool/cut

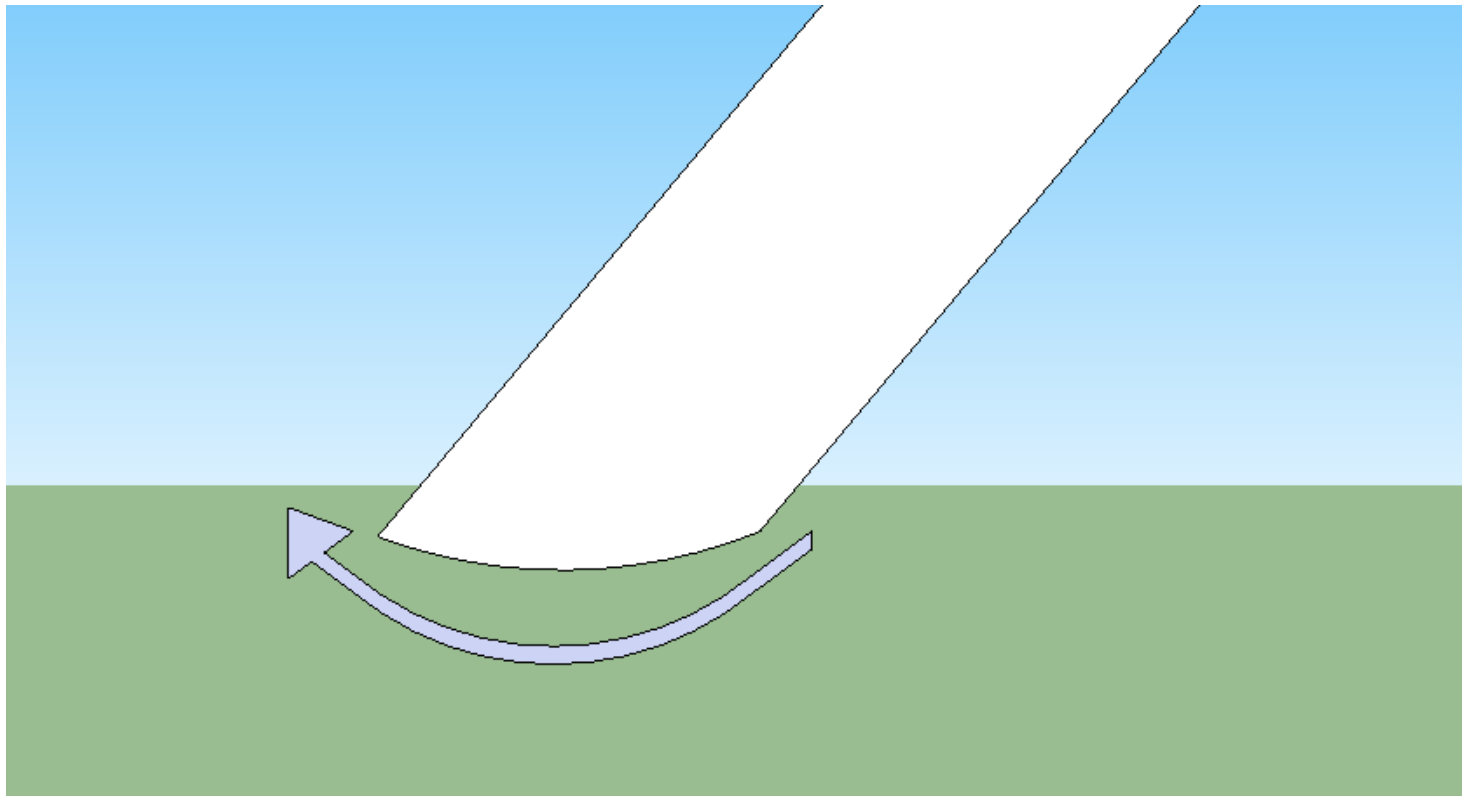
When you hone a bevel, you remove metal from the front and rear changing the radius to a flat bevel.



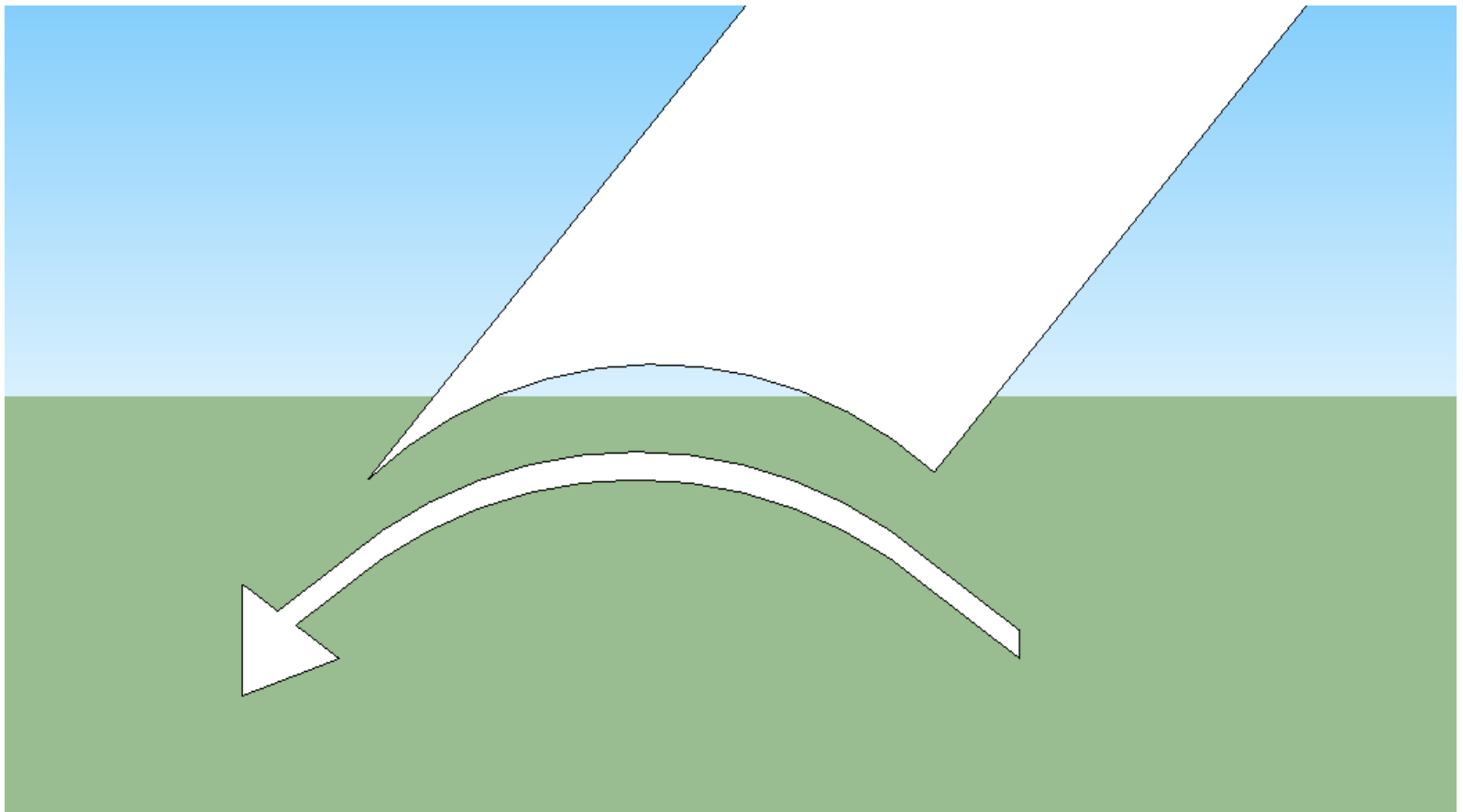
Notice that honing changes the cutting action. Instead of digging in, it will move straight ahead. It is still sharp, it just cuts (feels) different.



Much less used is a convex grind bevel, but it has an advantage; it works like a carving chisel. It wants to move up and out of a cut.



(Exaggerated hollow grind bevel)
Notice that the hollow grind wants to follow a radius into the work piece.



And to make it cut, you have to
raise the heel so it locates on only
the cutting edge

Long Bevel

With a long hollow ground bevel, there is more chance of a dig-in or catch due to the geometry

The void between the cutting edge and heel of the bevel wants to make the cutting edge dig in

This can be an advantage as well as a disadvantage!

Micro/Secondary Bevel

A micro bevel is nothing more than a primary bevel with a secondary bevel. It is not magic, it just serves a function.

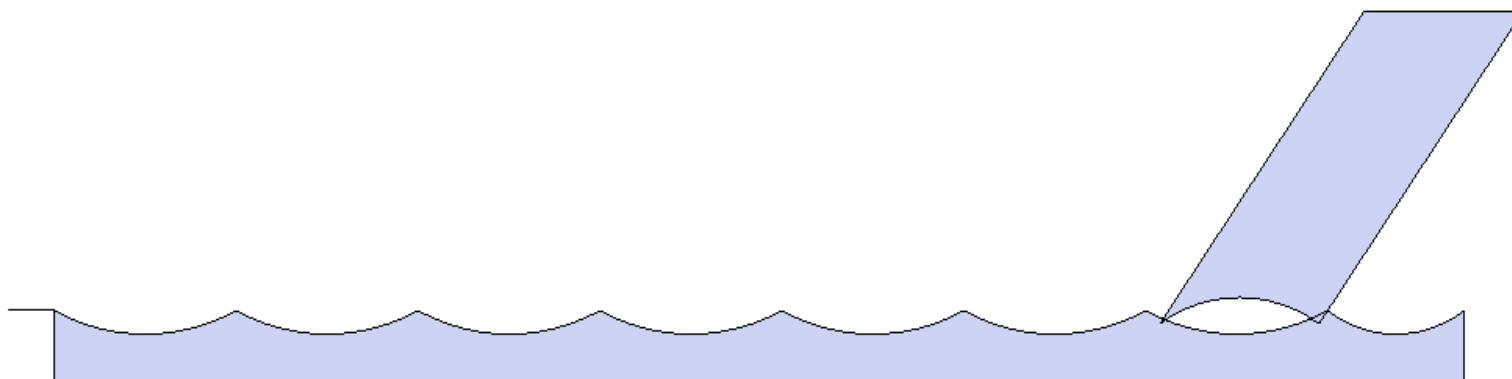
Secondary Bevel

The function of a secondary bevel is only clearance
If it clears by and inch, it is as good as a mile so the angle is irrelevant.

But a secondary bevel has a huge advantage in that it will overcome the washboarding which can occur on an inside curve as in the inside of a bowl, but can also occur anywhere a vibration/ripple might happen

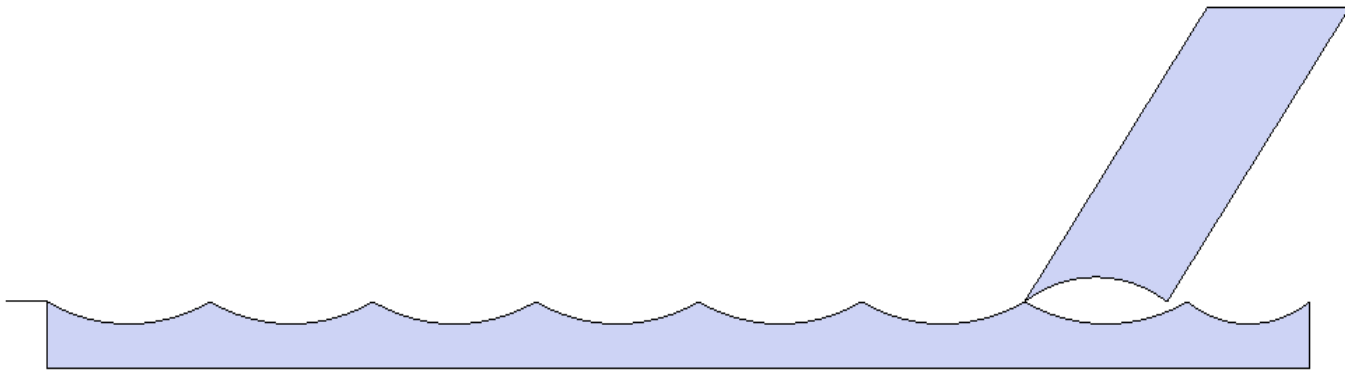
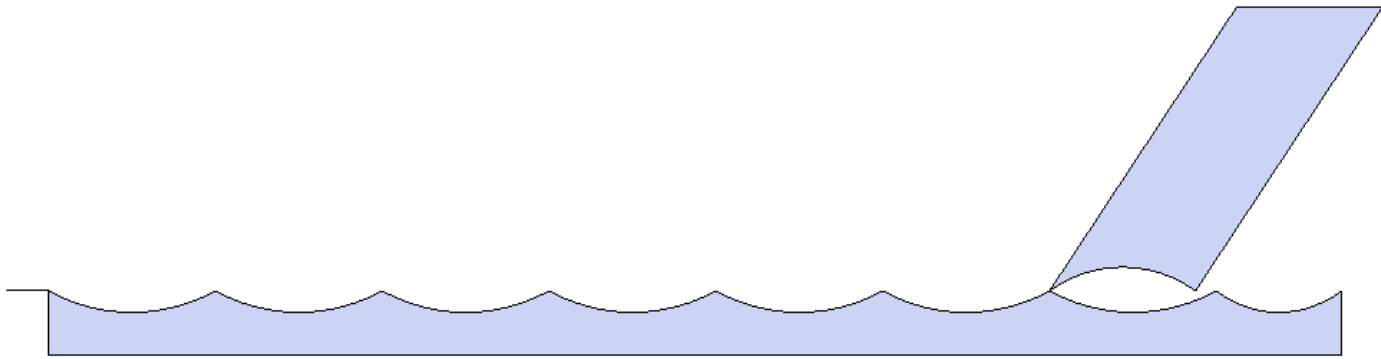
The problem with long bevels

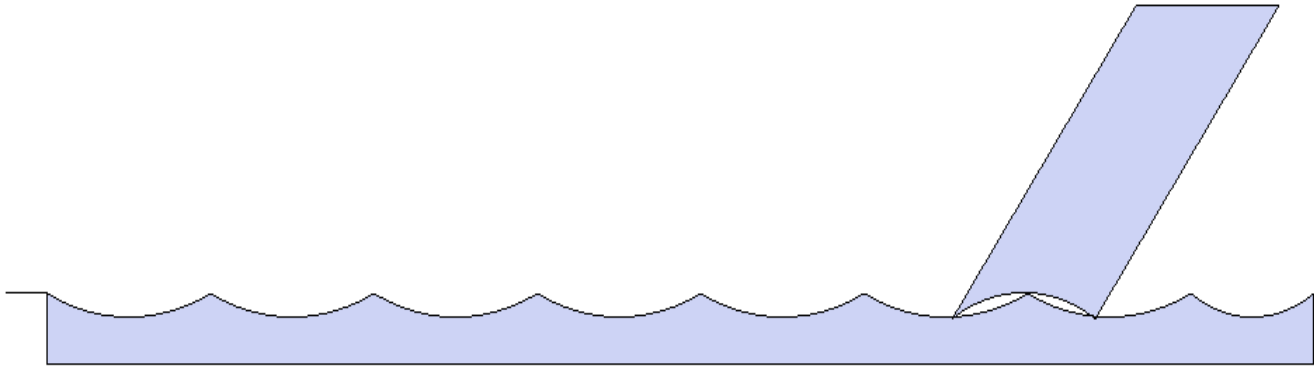
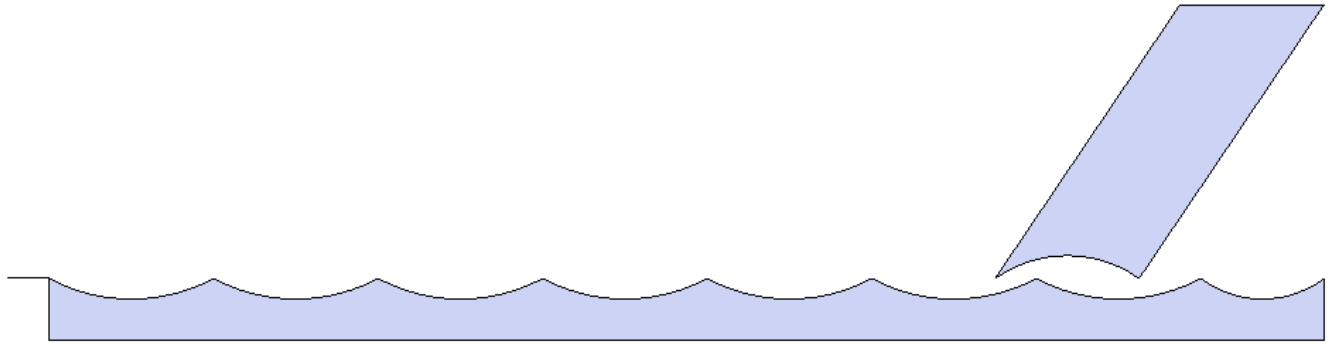
Illustrations are exaggerated for clarity



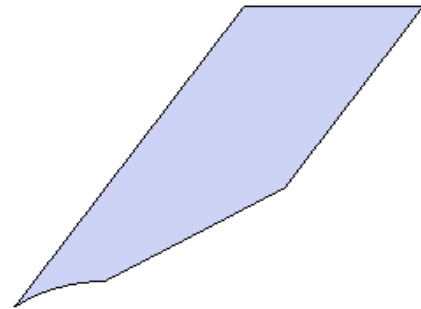
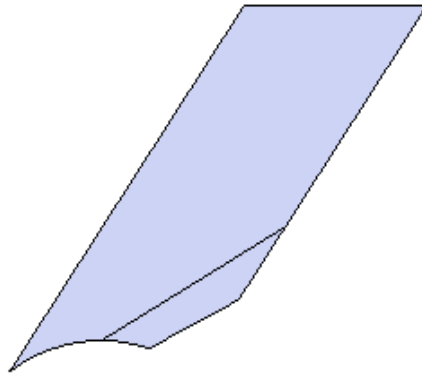
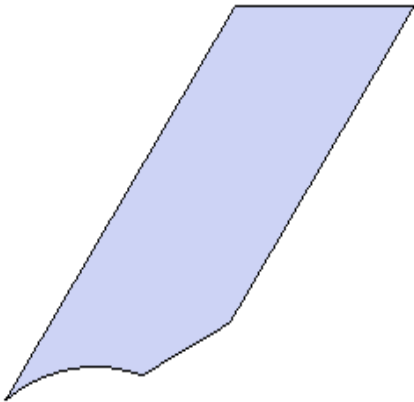
The long bevel and hollow grind will rise and fall with the washboard tool marks

The long bevel and hollow grind will rise and fall with the washboard tool marks

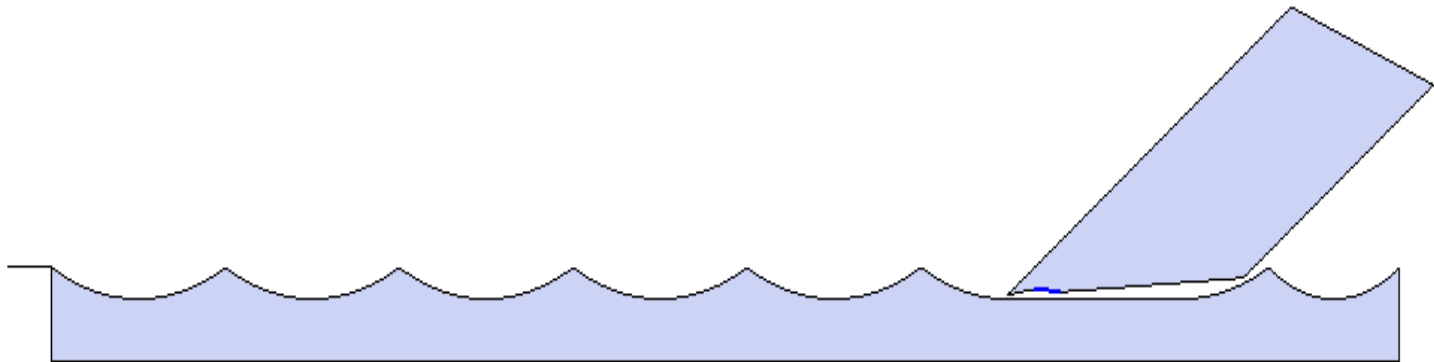
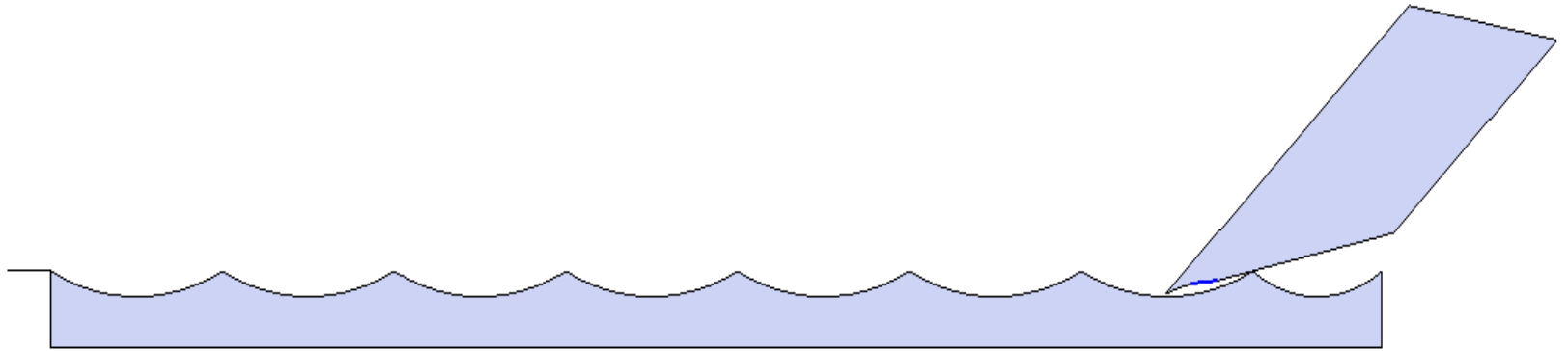




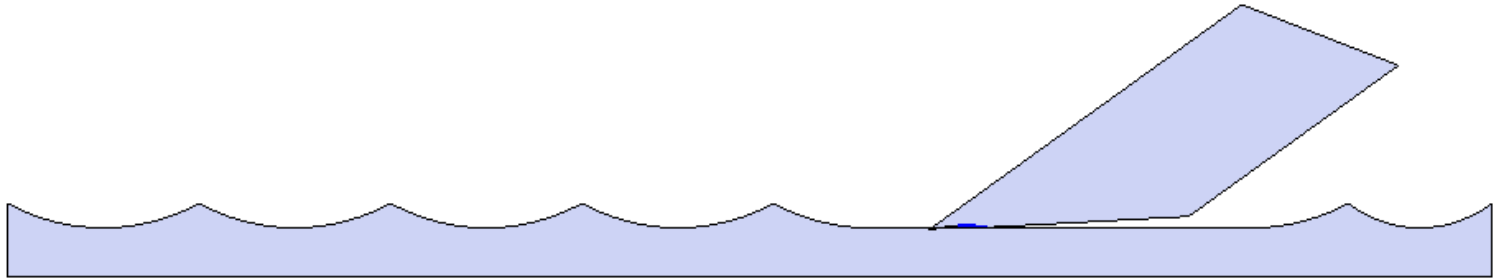
Grind a micro bevel (clearance) on the
gouge



By reducing the bevel length , it allows
the gouge to cut straight

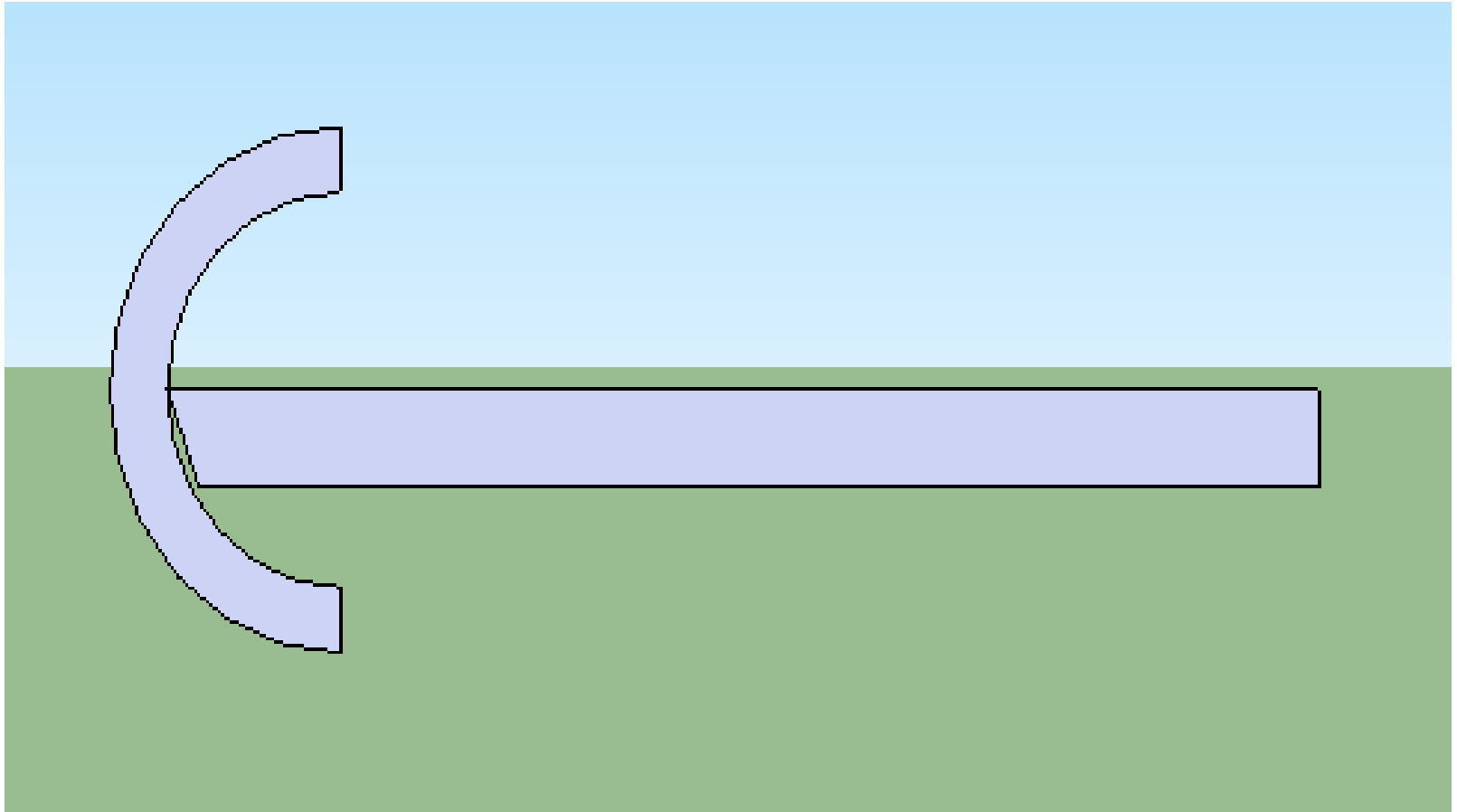


And ride along the surface cutting
straight & smooth without
bouncing



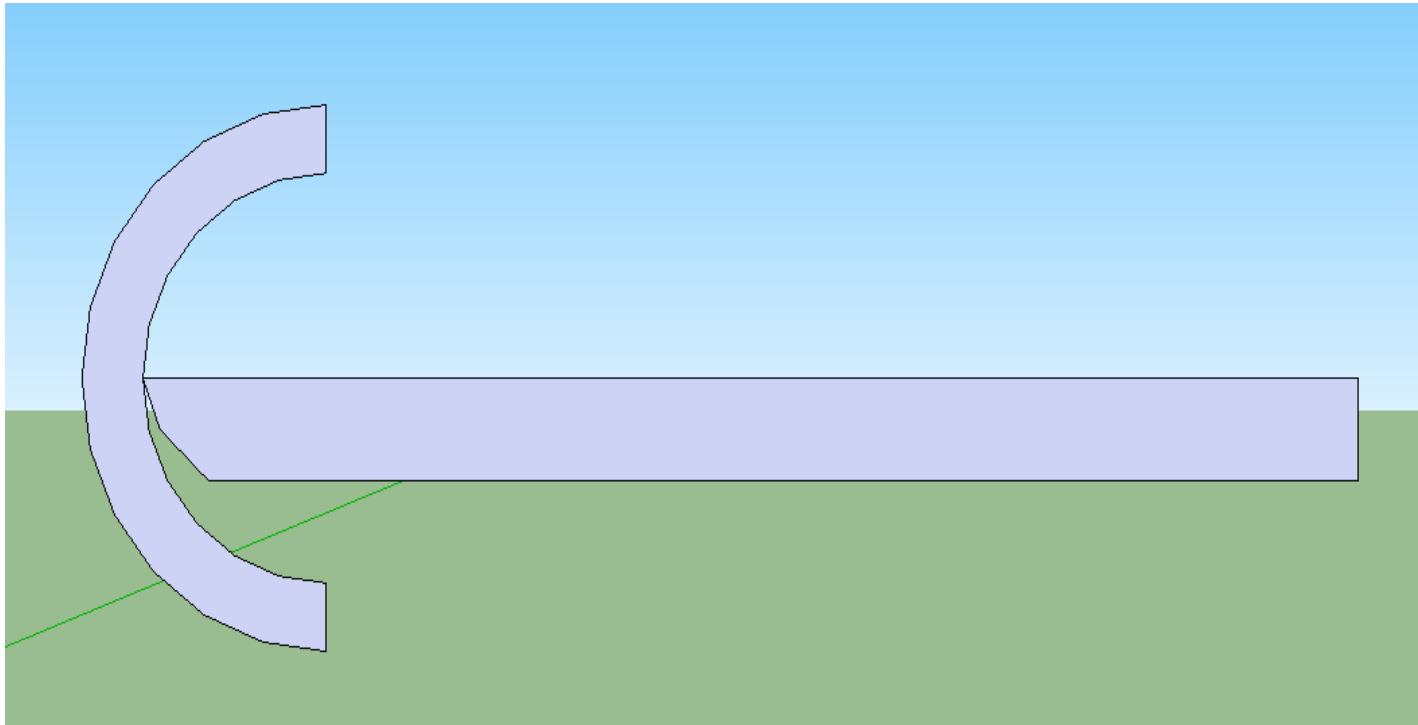
Secondary bevels are clearance angles.

Now lets look at a smaller bowl and the clearance under the cutting edge



Notice how the long bevel rubs too
much and limits the tool cutting
action

Now notice how adding a secondary bevel gives more clearance under the cutting edge to work piece, making smaller radius cuts at the bottom of the bowl easier.



In essence, the secondary bevel more closely imitates the inside curve of the bowl.