Lathe Tool Sharpening Basics

This handout covers six basic lathe tools for spindle and bowl (faceplate) turning:

1. **Spindle Roughing Gouge**
2. **Skew Chisels**
3. **Parting Tools**
4. **Spindle Gouges**
5. **Bowl Gouges**
6. **Scrapers**

The techniques in this handout involve the ***Wolverine*** sharpening jig system made by **One-Way, Inc.** Other brand systems, and low-speed water-type grinders such as the Tormek, may also be used, but the techniques and details provided here may not work directly with those systems. However, final edge shapes, "bevel angles," and other results achieved by all grinding wheel systems should be essentially the same. ***Wolverine*** products can be viewed at: https://oneway.ca/products-category/sharpening-grinding-jigs

Alternative Grinding Approaches: Besides the wheel grinders, several other systems can be used to sharpen lathe tools. NMWT member Dan Shipman recently demonstrated a belt sander adaptation using sanding belts on the sander's platen as the grinding surface. Another tool, the WorkSharp, uses rotating sanding disks for grinding tools. WorkSharp has an advantage of being able to view the bevel surface while it's being ground. Both of these systems produce a flat bevel from the flat grinding surface of sandpaper, instead of a "hollow grind" produced by grinding wheels. Flat grinds can be more difficult to hone and they are not within the scope of this presentation.

General Sharpening Approach

The process of sharpening turning tools can be described using three sequential steps:

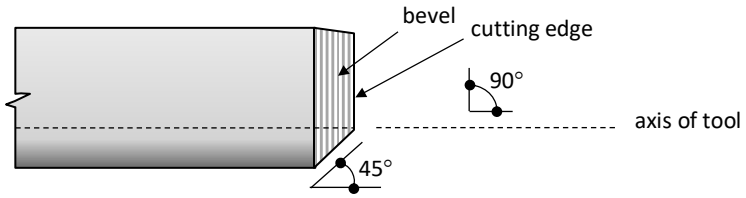
A. **Shape** the tool to the desired angles and dimensions. This is usually done with an 80 grit wheel.
B. **Sharpen** the edge with the grinder. Using a 120 grit wheel, or finer, can achieve this step.
C. **Hone** the edge to achieve a level of sharpness suitable for turning. Several types of hones will be demonstrated and explained.

Each of these steps will be described for the six tools covered in this presentation.

1. Spindle Roughing Gouge

The Spindle Roughing Gouge should NEVER be used unless the grain of the wood is running parallel to the bed of the lathe. It is NEVER used in bowl or other faceplate-type turning. That's why it's called a ***SPINDLE ROUGHING GOUGE!!!*** The "tang," or portion of the steel inside the handle, is much smaller than the rest of the steel that is visible and can easily break when under the stresses experienced during bowl (or other faceplate) turning.

Results Desired: The cutting edge of the Spindle Roughing Gouge should be at 90° to the axis of the tool, and should be flat in profile. The bevel of the cutting angle should be at 45° to axis. If the cutting edge has become rounded or out-of-square, redefine the cutting edge with a belt sander. A good technique is to gently press the cutting edge against the abrasive belt, with the axis of the tool perpendicular to the belt. Continue sanding until all of the *inside* of the tool's channel is true. Then grind the bevel, as below.



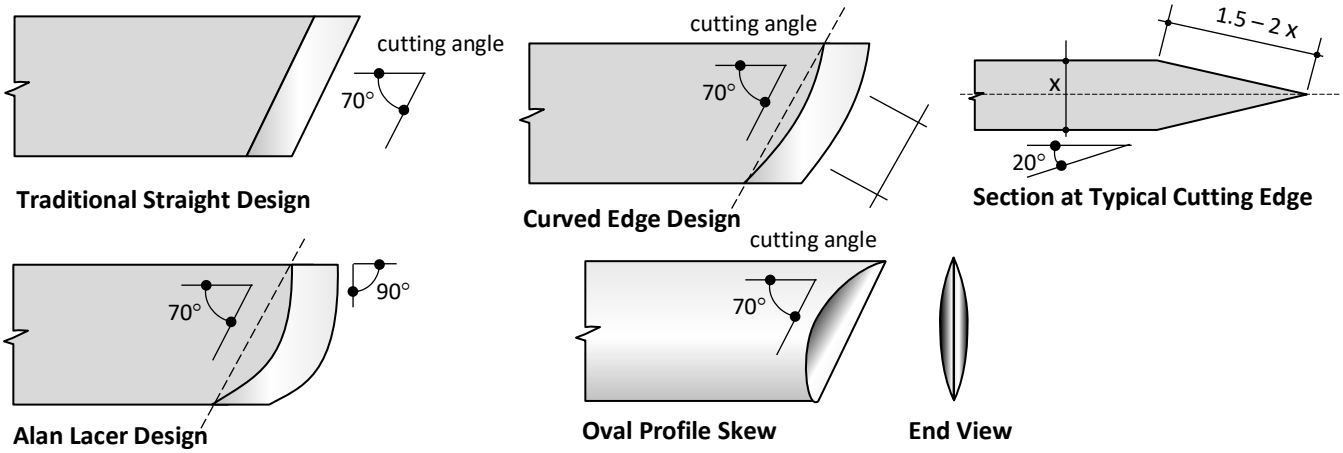
Standard Spindle Roughing Gouge

Sharpening Procedure: The tool is sharpened by placing its heel in the Wolverine Vee arm, extended to produce a 45° bevel. Grind the tool just until a cutting edge is achieved all around the edge of the tool to a single facet. (The top corners may be rounded over slightly.) It is usually not necessary to hone the edge of the Spindle Roughing Gouge, since the process of roughing wood will remove any burrs created while grinding.

2. Skew Chisels

Results Desired: Several basic designs for skew chisels are in use today, and the choice is largely personal preference. The cutting angle should always be approximately 70° from the tool's axis. The differences are in the shape of the cutting edge. The Traditional Straight Design has a straight cutting edge. The Curved Edge Design is preferred by many, and gives a somewhat wider "sweet spot" (between the heel and center of the edge) for planing cuts and cutting beads. The Alan Lacer Design, starts with a cutting angle almost 90° from the top edge for about a third the width, then transitions to a curved cutting edge. The initial straight portion is used mainly for peeling cuts.

While all three of these designs use flat bar stock to make the tool, some skews are made from an oval section, shown below with the Oval Profile Skew. The oval section can be seen from the end view. While some turners prefer the flexibility of rotating this tool on the tool rest, most find it difficult to manage, and sharpening accurately can be a challenge. Unfortunately, this design is included in many pre-selected tool sets.



Skew Bevel Angles: The bevel angle is about 20° from the tool's center axis on each side, yielding a total cutting angle of 40°. The current trend, however, is to use a narrower bevel angle for a sharper total cutting angle. It's now common for the face of the bevel on each side of the tool to be up to twice the thickness of the tool. Experiment and see the length of cutting bevel you prefer. (For an Oval Profile Skew, the same bevel angles apply, and the length of the bevel is taken at the center.)

Sharpening Procedure: All skew designs are sharpened using the same basic technique. One-Way makes a Skew Grinding Attachment for the Vee arm, but it is not recommended. The Wolverine platform is preferred because it allows flexibility for producing any design. Set the platform to grind at 20° to the axis of the tool. Holding the tool at a 70° angle to the wheel, grind just until a full single facet is produced on each side, alternating tool sides in the process. For the Straight Design, it's critical to keep the angles steady while sliding the tool on the platform from side to side. (Smaller skews can be sharpened without sliding if the wheel is wide enough.) For Curved Edge and Alan Lacer designs start grinding at the heel of the edge and smoothly "sweep" the edge by rotating the tool towards the tip. While not difficult, learning this technique does take some practice. **One tip**: Clean and wax the platform and sides of the tool so the sweep/rotation proceeds smoothly. With brand new skew chisels it is critical to round the tool's corners, commonly using a sander, so they can slide over your tool rests and not nick or damage the surface of the rests.

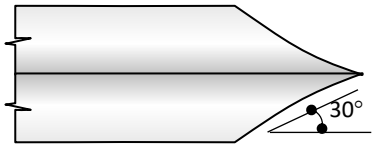
Oval Profile skews are particularly challenging because they lack a flat surface to rest on the grinder platform. Due to their oval cross section, it is not practical to produce a curved cutting edge.

Honing: A Skew Chisel needs to be honed more than any other lathe cutting tool, and depending on the wood being cut, may need to be honed every few minutes. A flat diamond hone is the best accessory to use in honing.

One source for top quality hones is from Alan Lacer, who has demonstrated at NMWT several times. His hone is available at http://stores.alanswoodturningstore.com/diamond-hones-by-alan/.

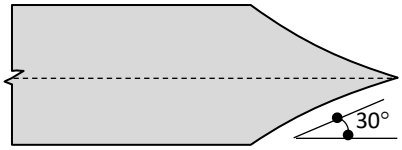
3. Parting Tools

Results Desired: Parting tools are made in two basic designs, flat and diamond. The bevel angle of the parting tools is generally ground at 30° to the axis of the tool. The cutting point should always be at the center of the tool, which is easy on the diamond shape – it has a line at the center, which is its widest point.



Diamond Profile Parting Tool

End View



Flat Profile Parting Tool

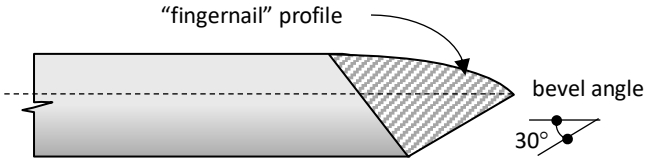
End View

Sharpening Procedure: Both types of tools are sharpened by placing the heel of the tool in the Wolverine Vee arm, extended to produce the desired angle. Take care to hold the tip being ground steady and not "sweep" sideways, which will produce a slightly curved cutting edge. Alternate sides while grinding to keep the bevels symmetrical and the tip at the center of the tool. Honing: The Parting Tool works best when it is honed on a flat diamond hone prior to use. The tool can be used in a "peeling" cut or a "scraping" cut. Both are appropriate uses of the tool. When used in the scraping mode, the tool must be honed (and eventually sharpened) much more often.

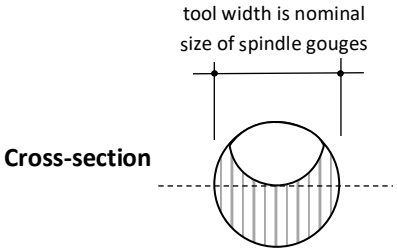
4. Spindle Gouges

Results Desired: Most spindle gouges are shaped with a "fingernail" profile at the cutting tip. Various bevel angles and side shapes are used. While there are individual variations, the guidelines described will produce a good cutting shape that is widely used.

Smaller diameter Spindle Gouges (1/4" or so) are often ground as "detail gouges." For this grinding design, the bevel angle is reduced to 20 – 25° from the axis of the tool. The longer, somewhat flatter profile produced works well in small, tight places, such as fine coves and beads and on finials. True detail gouges have a somewhat shallower cross section than shown below.



Spindle Gouge



Cross-section

Sharpening Procedure: Producing this relatively complex shape is done with a special attachment to the Wolverine system, the ***Vari-grind*** jig. The ***Vari-grind*** jig is used in conjunction with the **Vee** arm and a simple shop-made jig for setting the Vee arm extension is described at the end of this handout.

Setting the Jig: The *first* setting of the Vari-grind jig is the angle of the jig's arm. The top* of the arm should be set at the second notch on the jig's radius. (The first notch is the one closest to a tool when inserted into the jig. *The top is the side closest to the tool.)

The *second* setting is the tool's projection from the face of the jig. For most conditions, the tip of the tool to be ground should protrude 1-3/4" from the face of the jig. It helps to have a simple aid to achieve this. Drill a 1-3/4" flat-bottomed hole in some scrap hardwood, about 5/8" in diameter. With the holding nut slightly loosened, rest the Vari-grind jig on the wood and rest the tool on the bottom of the hole, then tighten the jig. Using this aid assures a constant setting of the projection. **Be sure the nut is tightened securely**.

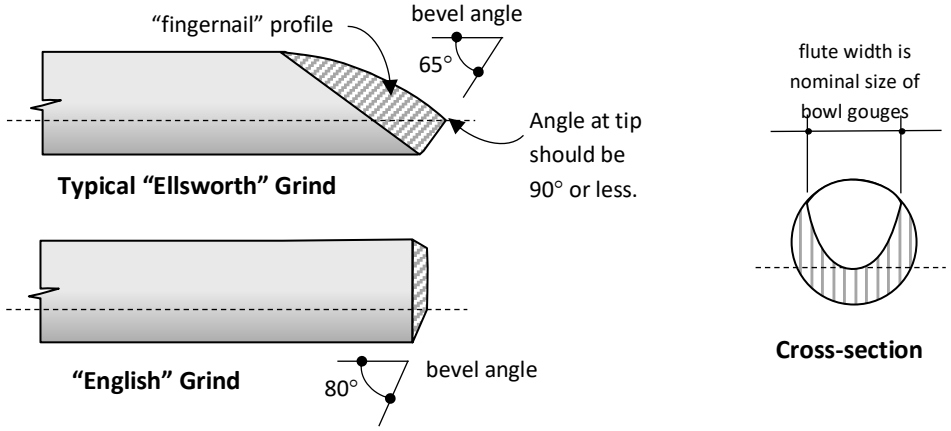
The *third* setting is the bevel angle. For most uses, the bevel angle of the Spindle Gouge is about 30° from the tool's axis, although some turners prefer up to 40° for general spindle work. Setting this angle involves some trial and error. With an angle guide, determine by eye the desired change from the current angle on the tool, and move the Wolverine Vee arm in or out to change the grinding angle as desired. It helps to color the surface of the bevel with a marker and test the grind by touching the tool to the grinder wheel while it's spinning slowly. Examine the resulting area ground off, and continue to adjust the arm extension until the desired angle is achieved at the point of the tool. A setting jig described at the end of this handout will produce the recommended 30° bevel angle automatically.

Once the bevel angle is achieved at the center, grind the tool, from the sides to the center, to form a curving "fingernail" profile. The profile should always be slightly convex, never completely flat or at all concave. A good fingernail profile takes some practice. While the jigs are helpful, the final profile is up to you!

Honing: It's a good idea to hone the inside of the tool's "flute" with a diamond hone, or use a buffing wheel with fine buffing rouge.

5. Bowl Gouges

Results Desired: Bowl gouges are generally shaped in one of two basic grinds. The Ellsworth, also a "fingernail" grind, is by far the more popular and is used for most bowl shaping and hollowing. The English grind, much less known, is a handy shape for use while hollowing the bottom of fairly deep bowls, and allows the turner to "ride the bevel" in places where the sharper bevel angle of the Ellsworth shape would not clear the sides of the bowl.



Sharpening Procedure: Sharpening the Ellsworth grind is similar to the Spindle Gouge described above, but uses different settings and dimensions.

Setting the Jig: The *first* setting of the Vari-grind jig (the angle of the jig's arm) should be for the top of the arm at the fourth notch on the jig's radius.

The *second* setting (projection from the face of the jig or "stick-out") should be 2". A block drilled with a 2" deep hole can be used for consistency, as is done with the Spindle Gouges.

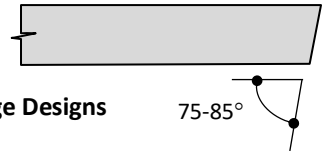
The *third* setting (bevel angle) is in the range of 65° from the tool's axis. One critical point to consider is the angle of the profile to the bevel angle at the tool's tip. It must be 90° or less so the tip of the tool can reach into fairly sharp corners. If the angle is blunt, shaping the outside of many bowls, especially at the base, will be difficult. Again, the jig in this handout will produce the recommended 65° bevel angle automatically.

Sharpening a Bowl Gouge with the English Grind is far simpler and doesn't require a Vari-grind jig. The safest way to grind at this angle is to rest the tool on the Wolverine platform and rotate the tool to achieve a flat cutting edge.

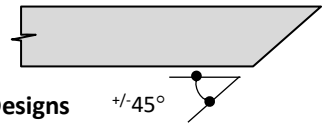
The heel of the tools can be set into the Wolverine arm which is then extended to achieve a fairly flat bevel angle of about 80°, but ***this arrangement is unstable, unsafe, and not recommended***. The corners of the cutting edge are also rounded over slightly to prevent catches.

6. Scrapers

Results Desired: There are a wide variety of scraper shapes, ranging from flat, angled, curved to one side or the other, or round-nosed. A round-nosed scraper is most commonly used in spindle turning. Bevel angles vary with personal preference but fall into two general types, Tapered or Blunt. The bevel angles at the tool edges range from about 45° for Tapered style up to 85° for Blunt designs. Using scrapers, however, defies the general rule of "rubbing the bevel." It is pointed at a downward angle, and only the very edge of the tool does the cutting.



Blunt Edge Designs



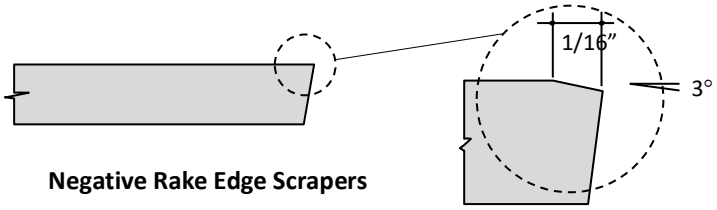
Tapered Edge Designs

Sharpening Procedure: Possibly the simplest tool to sharpen, the Wolverine platform is set to the desired bevel angle and the tool is smoothly swept across the grinding wheel until a single facet is achieved. Take care to keep the bottom surface of the tool flat on the platform, and as with the skew, waxing the platform and tool is highly recommended.

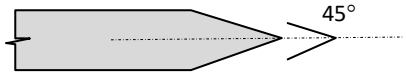
Scrapers and Burrs: Right off the grinder, there is a burr on the edge, which can do the cutting. However, the grinder burr is unpredictable and may be too coarse for use. The grinder burr is usually honed off and a new burr "rolled" on the edge with a hardened steel tool, as with a cabinet scraper in general woodworking. Like the fine honed edge of a Skew Chisel, the burr on a Scraper should be renewed frequently. For very fine scraping situations on very hard wood, the Scraper can be used without any burr at all. Simply hone off the burr on a newly sharpened Scraper and use. Even without a burr, the edge must be renewed frequently.

Veritas makes an excellent tool to roll a new burr on scrapers, with two interchangeable rolling points. It can be found at http://www.leevalley.com/us/wood/page.aspx?p=20266&cat=1,330,49233&ap=1. Another burnisher can be made from a kit sold by Alan Lacer, available at http://stores.alanswoodturningstore.com/burnisher-kit/.

Negative Rake Scrapers: With increasing popularity, turners are putting a "negative rake" on the cutting edge of their tools. This rake is actually a very narrow micro-bevel along the tool edge top surface, shown in the diagrams below. This micro-bevel is about 1/16" wide and cut very flat to the top surface, about 3°. The advantage of the negative rake is that the tool can be held virtually flat on the tool rest while the actual cutting edge is slightly downward, which promotes good scraper action and lessens catches. It can be very useful inside bowls where pointing a normal scraper slightly downward can be awkward.



Negative Rake Edge Scrapers



***"Extreme" Negative Rake Scrapers**

***Added 1/27/2015**

"Extreme" Negative Rake Scrapers: Recently, a new version of scrapers has been promoted by AAW Past-President Tom Wirsing that takes advantage of the newer high-speed steels with high (10%) vanadium content. These scrapers take advantage of the grinder burr, which is particularly strong when ground with these steels. The tools are ground symmetrical to the center with an included angle of 45° (bevel angle of 22.5° on each side). On

very hard woods the edge scrapes the wood with ***very*** gentle pressure, producing an extremely smooth surface that is virtually free of tear-out.

Unlike standard scrapers, the burr must be produced by the grinder wheel and cannot be refreshed by "rolling" the edge with a hardened tool.

One advantage to this design is that the tool can be flipped top-to-bottom to expand the range of curved edge shapes available for scraping. When the tool is flipped, the burr must be re-ground on the top surface, but that process is very quick, requiring only a few gentle passes over the grinder wheel using the same angle settings for both sides of the tool. The very best results can be achieved with the new CBN (Cubic Boron Nitride) grinder wheels, although standard wheels will also produce a successful burr. The keys to success with this design are gently pressure when scraping and frequent refreshing of the burr.

Grinder Tips:

1. When using a variable speed grinder, always start at its lowest speed and increase the speed only after the wheels have come up to full starting speed. The best fixed (single speed) for sharpening turning tools is approximately 1750 RPM, which is commonly referred to as "slow speed grinding." Many grinders sold today have a single speed of about 3600 RPM, which is much too fast for efficient sharpening.
2. While in the process of sharpening, use a light pressure on the tool against the wheel. Let the wheel do the work. Forcing the tool against the wheel in an effort to increase material removal is dangerous. It will significantly increase the heat of grinding, and worst case, can damage the wheel, even causing breakage.
3. While grinding, cool the tip of the tool frequently in a vessel of water. Although high-speed steels are not damaged by grinder heat, the tools can become so hot that they are dangerous to hold and can cause burns.
4. Before turning on the grinder, lightly tap the wheels to check for cracks. A cracked wheel will "thud."
5. When starting a grinder, always stand to the side of the wheels. During start-up and shut-down is when a wheel is most likely to shatter, and broken pieces may be sent at high speeds in the plane of the wheel.
6. **NEVER** grind on the side of the wheel.
7. Grinder wheels should be "dressed" frequently with a diamond-surfaced dressing tool. Dressing renews fresh cutting grit to the surface of the wheel and also insures a flat, true surface.
8. The platform of the grinder must be kept clean and free of nicks or other surface defects that could impede smooth movement of tools while grinding. Frequently clean the platform surface with alcohol or mineral spirits and apply a coat of paste wax to the surface and buff. (Treatment is similar to lathe tool rests.)
9. Before grinding tools, smooth off sharp corners that might catch while moving the tool during the grinding process (or along the lathe tool rests). Waxing the tools' shaft can also facilitate smooth movement.
10. Never adjust the platforms or jigs while the grinder is running.
11. Never try to slow the speed of a wheel after the grinder is turned off by rubbing it with any object.
12. Take care to not breathe the grinder or tool "dust." Clean (vacuum) the grinder area frequently.

Grinding Wheel Identification: This topic is too complex to cover fully in this handout, but a very brief overview is as follows: A typical grinding wheel label will have a code printed on it, such as "**8 x 1 x 1 WA 120 – K – V**." Taking this code apart, the elements are:

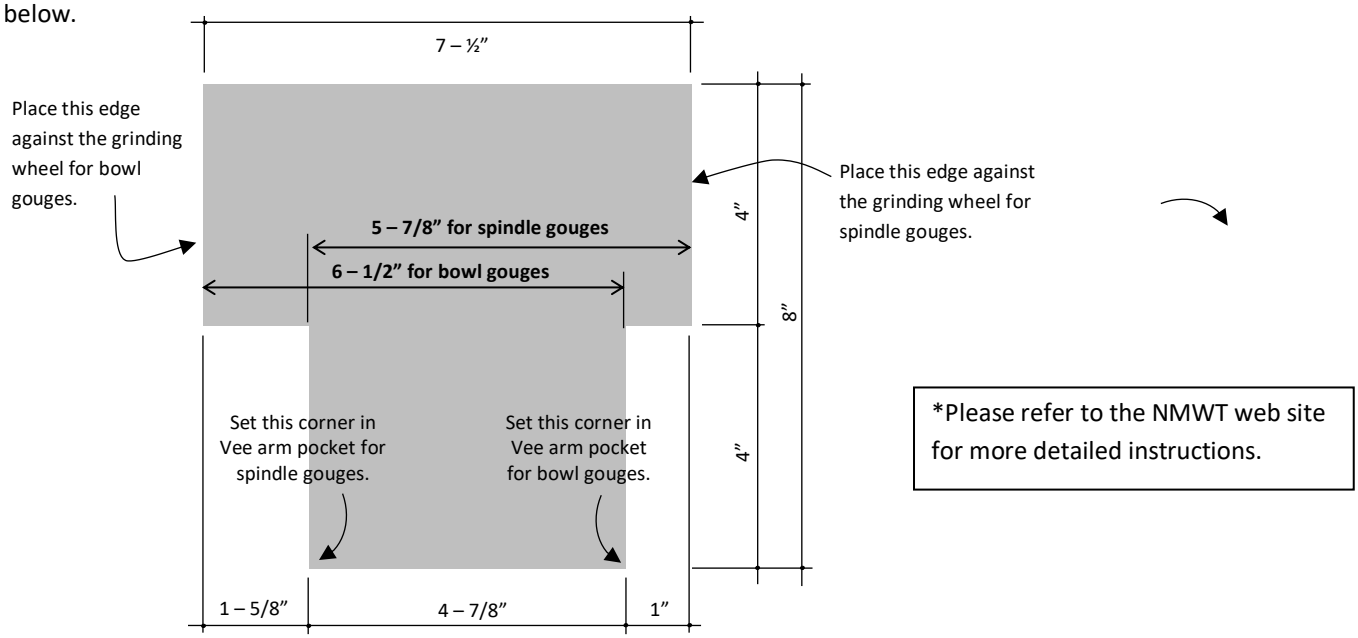
8 x 1 x 1 - Wheel size in inches. The sequence of numbers is the wheel diameter (8), the wheel thickness (1), and the arbor size (1). The arbor size is the cast size and may be reduced by bushings, which may or may not be supplied with the wheel.
WA - Abrasive type. "A" is Aluminum oxide, the most common. The "WA" is for White Aluminum oxide, one option.
120 - Grit (or Grain) size. 120 grit is fairly fine. Most wheels for woodturning tools will be in the 60 – 120 range. Often, new grinders are supplied with 36 grit wheels, too coarse for most turning tools.
K - Hardness grade. Typical range will be H to N, where the H is softer. Alan Lacer prefers J, while Jerry Glaser has recommended I.
V - Bond type. V is for Vitrified, which is the most common.

NOTE: Alternative wheel materials, such as diamond impregnated wheels and/or CBN (Cubic Boron Nitride) coated wheels are not covered in this handout. These wheels can produce extremely fine results, but cannot be used with carbon steel tools, which they clog and render unusable.

Lathe Tool Sharpening Basics

A Set-up Jig for positioning the Wolverine Vee Arm *

Thanks to Gale Greenwood and Bill Zerby, a shop-made jig can help set up the Wolverine system for grinding Spindle and Bowl gouges. Scrap material, such as ¼" MDF can be used, and a simplified version of this jig is shown below.



*Please refer to the NMWT web site for more detailed instructions.

Use of the Jig: One edge of this set-up jig is used for spindle gouges, and the other edge for bowl gouges. Hold the edge of the jig for the tool to be sharpened vertically against the grinding wheel. Next, adjust the position of the Vee arm, so that the diagonally opposite bottom corner of this set-up jig is firmly held in the pocket of the Vee arm. Lock the Vee arm in this position. Care must be taken to hold the jig straight and true.

Now you can put the set-up jig aside, and sharpen your gouge using the Vari-grind jig, as described earlier in this guide.