SHARPENING WOODTURNING TOOLS

Richard Pikul 230923

This application note is not to be taken as the only way to sharpen woodturning tools. It is made up of the different things I have learned about sharpening and somewhat biased towards my methods. It also does not include all of the various available sharpening systems, tool holding jigs, shapes of tool cutting bevels/edges or available tool types.

It is better to purchase a quality tool and happily use it for multiple purposes than to purchase a set of cheap tools for the same price and be unhappy for years.

However, a great way to learn how to sharpen is to aquire an inexpensive tool, grind it over and over again as practise and to develop your sharpening skills.

All videos recommended in this note are listed, with descriptions, in the Appendix at the end.

1. CHOOSING A SHARPENING METHOD

1.1. Standard grinder: Lots of makers to choose from. Do some research before buying.

1.1.1 Recommended grinder specifications:

- 3/4HP (750Watts) is ideal. 1/2HP (375Watts) is slow to start (up to 8 seconds), but acceptable.
- Wheels; 8” (20cm) diameter x 1” (2.5cm) wide. 1.5” (3.8cm) wide wheels can be more useful.
- Speed: 1500-1750 RPM. 3400-3600 RPM grinders can be too aggressive for woodturning use.
- Note: The wheel guards on most grinders will not fit around most CBN wheels. If the existing inner guard ‘fits’ around the CBN wheel, but the cover does not – keep the inner guard as it will prevent steel ‘dust’ blowing into your shop. To capture most of the steel dust, place a few strong magnets on the outside of the guard, this will attract steel dust to the inside of the guard.

1.1.2 **Grinder wheels:** Those acceptable for woodturning, listed in preferred order:

- CBN (Cubic Boron Nitride), wheels run the coolest, no dressing necessary, last for many years and result in the keenest, longest lasting edge on your tools.
- Microcrystalline wheels (aka ceramic aluminum oxide) are harder and sharper than conventional aluminum oxide wheels. These leave a sharper edge and run cooler than conventional aluminum oxide wheels.
- Silicon carbide wheels are harder than aluminum oxide and have a very sharp grain. This material is actually more suited for angle grinders than for woodturning.
- Aluminum oxide wheels are made in varying qualities, choose carefully, pick ‘hard’ wheels.

1.1.3 Recommended combination of wheels to put on your grinder:

- One 180 or 220 grit CBN wheel, one 60 grit non-CBN wheel.
- Two CBN wheels; one 80 or 120 grit, the other 220 grit (320 grit if also sharpening carving tools). If you prefer a honed edge, very fine grit wheels (350-600grit) are available.
- Two Aluminum Oxide wheels; one 60 grit, the other 80 or 100 grit.
- Note: ‘White’ aluminum oxide wheels are relatively soft, they are good for sharpening, but can be easily ‘grooved’ requiring constant dressing so can wear out quickly.

1.2. Premium grinders:

- Tradesman; expensive, high quality, superb performance. This grinder uses CBN wheels only. Note that their grinders are ‘ready to use’ with Oneway and Tormek grinding jigs.
- Tormek; expensive, high quality, superb performance. Superb for wood carving tools. Takes some time when you need to reshape a tool. Jigs for woodturning tools are available.

1.3. Belt sander sharpeners:

- Sorby; Expensive, platform for most tools, optional gouge jig. Easy to change belt.
- Lee Valley; Sells a ‘low budget’ belt sander that uses standard sandpaper belts. No jigs.

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2. SHARPENING AIDS:

- Sharpening can be done using various aids. The most common is the standard 'platform' that comes in various shapes and sizes with grinders. The platforms normally supplied with grinders are designed primarily for machinists. Practical woodturning platforms are available from various manufacturers.
- The Oneway 'Wolverine' grinding system is the most common and it can be found in woodturning workshops all around the world. Available for it are 'Vari-Grind' and 'Vari-Grind 2' attachments that are used for shaping gouges. Also available are other accessories and a small format platform. Stuart Batty tools make an excellent platform for woodturners, one type will fit the Oneway 'Wolverine' grinding system.
- Rikon now makes a higher priced copy of the Oneway system, with a few added features.
- Tormek has their own system for grinding gouges, skew chisels and other tools.
- Sorby's belt sander system has a jig for gouges. Other tools are sharpened on its platform.

Regardless of the system you have or intend to purchase,

REMEMBER TO FOLLOW INSTRUCTIONS PROVIDED BY THE MANUFACTURER

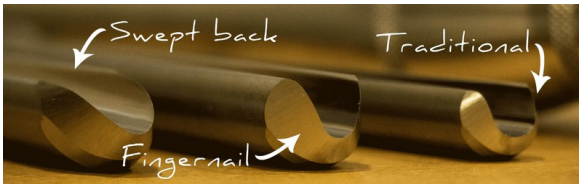
This is very important for any system or tool that you purchase! Failure to do so will inevitably result in frustration, poor results and possibly damage to equipment or tools.

Tool steels that woodturning tools are made of:

- High carbon steel usually includes carbon-tungsten-chromium, sometimes vanadium.
- M2: carbon-Chromium-Vanadium-Tungsten-Cobalt-Molybdenum-Manganese high-speed steel.
- M42: carbon-cobalt-molybdenum-chromium-vanadium-tungsten high-speed steel. It has a higher cobalt content than M2 steel. Claims are that it holds an edge longer.
- CPM M4: high carbon content chromium-magnesium-molybdenum-sulfur-tungsten-vanadium powdered metal high-speed steel. High carbon content results in better wear resistance
- CPM 10V: high carbon content manganese-silicon-chromium-vanadium-molybdenum-sulfur powdered metal steel, also containing carbide particles.
- CPM 15V: contains more vanadium than CPM 10V steel and also includes carbide particles.
- **CBN wheels are recommended for any steel that contains carbide particles as microcrystalline and Aluminum oxide wheels are not hard enough to sharpen carbide.** Sharpening CPM 10V and CPM 15V type steels with Aluminum oxide or microcrystalline wheels results in edges that are not as 'keen' as when sharpened with CBN wheels.
- You can grind all types of magnetic hardened steel using CBM wheels. This includes any type of powdered metal or carbon steel. There is some discussion that carbon steel tools will 'load up' CBN wheels. That has not been my experience. I have been sharpening carbon steel tools on CBN wheels for several years without any problems. Although not many carbon steel woodturning tools are made today, many are still in use. Some made as much as 100 years ago are still around and surprisingly still quite usable. It may even be a lucky find for a good tool. I have a skew chisel made by Spear and Jackson, made around 1920. It is a favourite of mine for some small work even though it requires frequent honing to maintain a sharp edge.

3. SHARPENING BOWL GOUGES:

- Primarily used for making bowls, these gouges are also useful for some spindle work, shear scraping and shallow hollowing.
- Modern bowl gouges are made with three different flute shapes: “U”, parabolic, and “V”. Parabolic flutes are common as for most applications they are the most useful shape.
- There are three basic bevel shapes, a wide variety of angle recommendations and multiple methods of sharpening. The basic method is to use a platform to grind the edge. A jig to hold the gouge in a ‘pocket’ makes it easier to grind a consistent edge with a single facet. For an author’s guide to setting the angle of a Oneway ‘Vari-Grind’ jig, see the Appendix.



Sharpening different bowl gouge flute shapes:

3.1. “U” FLUTE: Flute is shaped similar to a spindle roughing gouge and simple to sharpen just using a standard platform and rotating the tool. This shape can also be sharpened using an arm extending from the grinder with a pocket into which the end of the tool’s handle is inserted and the tool laid on the wheel and rotated to sharpen. Do not over-rotate as this will result in rounded 'corners'. Grinding this shape on a parabolic or “V” shape gouge is not recommended.

Traditional grind video: https://www.youtube.com/watch?v=wncWJQHdlJg

3.2. PARABOLIC & ‘V’ FLUTE: These can be ground to many different edge shapes.

3.2.1. Fingernail grind: This shape is versatile as it can be used for roughing or detailing. Although it can be shaped by hand using a platform, a grinding jig such as the Oneway ‘Vari-Grind’ makes it easier to obtain a clean bevel. Note that all gouge grinding jigs only provide the stability to smoothly grind the angle of the bevel. **The bevel shape is up to the person grinding the tool.**

Fingernail grind video: https://www.youtube.com/watch?v=SoRLvTkXmzw

3.2.2. Swept back grind: aka ‘Ellesworth’, ‘Irish’ and other names. This is the most commonly used grind for bowl gouges. The bevel angle can vary from 40 to 70°, with 60° being the most common. This grind can be made on both parabolic and ‘V’ shaped fluted gouges. It is not practical to make for ‘U’ shaped flutes. Note that all gouge grinding jigs only provide the stability to smoothly grind the angle of the bevel. **The bevel shape is up to the person grinding the tool.**

Swept back grind video: https://www.youtube.com/watch?v=yfjBdenzxOQ

3.2.3. Asymmetrical grind: Fingernail grind on one side and a swept back grind on the other side of the flute. A solution to those who have one bowl gouge but need two. This shape was developed by Richard Raffan.

Need to see his video to appreciate how to sharpen a bowl gouge to this shape and how to use the tool effectively: https://www.youtube.com/watch?v=cnNBBV19YLw

3.2.4. 40/40 grind: A 40/40 bowl gouge grind refers to the angles incorporated in the specific sharpening process for this gouge. The bowl gouge bevel angle of the 40/40 grind is 40-degrees, as are the side wing edges. Also, the top slope of the wings to the flute cutting tip is a 40-degree angle. Claims are that this grind cuts smoother and cleaner.

Stuart Batty video (includes sharpening other tools, excellent video): https://www.youtube.com/watch?v=nKxy2t0htpY&t=1s

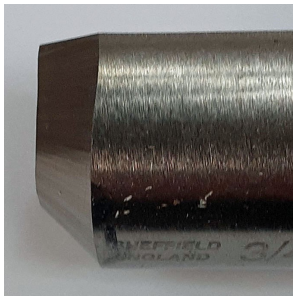
Ron Brown video: https://www.youtube.com/watch?v=dcFIZ5Bx4t8 (Note: this video includes the use of a 40/40 purpose made gauge that the maker sells.)

Peter Miao video: shows a gauge that can be shop made and used for making 40/40 grinds: https://www.petermiao.com/news/2017/11/11/a-jig-for-4040-grind

4. SHARPENING SPINDLE ROUGHING GOUGES:

This style of gouge is designed for use in spindle turning (workpiece held between centres and grain running between the centres). It is dangerous to use this type of gouge on cross grain / face grain work.

- Spindle roughing gouges are mainly used to reduce square blanks to a cylinder. The gouge can then be used to turn the 'basic' shape, followed by detailed shaping with other tools. Spindle roughing gouges are available in a range of shapes and sizes, the most popular is the 3/4" (19mm) deep fluted "U" gouge.



- A spindle roughing gouge can be sharpened by setting it on a platform, then rotating the tool. It can also be sharpened using an arm extending from the grinder with a pocket that the handle end of the tool is inserted. The tool is then laid on the wheel and rotated to sharpen. When sharpening, do not over-rotate the tool to prevent rounding the corners. Straight edges, ending in sharp corners are very useful in making crisp shapes and deep 'peeling' cuts.
- A spindle roughing gouge should be sharpened square across with a single bevel, typically 45°.

  Video: Sharpening on a platform: https://www.youtube.com/watch?v=776N-lr0D8g

  Video: Sharpening with a 'V' arm: https://www.youtube.com/watch?v=DrtTYyNYw4k NOTE: this video uses a grinder with stone wheels and no wheel guards – NOT RECOMMENDED!

  Video: Different types of roughing gouges, Richard Raffan shows how they are used: https://www.youtube.com/watch?v=rA0MaWollv4

5. SPINDLE AND DETAIL GOUGES:

Most spindle and detail gouges are sharpened with a bevel angle between 30° and 40°. The recommended / preferred shape of the bevel can vary from a shallow fingernail to a severe swept back grind. As the name suggests, spindle gouges are primarily used for spindle turning. They are also a very effective tool for shallow hollowing. If sharpened to a steeper angle like 45°, they can also be used for shallow bowls and platters.

Shapes of grinds:

5.1. Fingernail grind: This can be shaped using just a platform with either a grinder or belt sander. When using a jig, a spindle gouge is sharpened the same way as a bowl gouge with a different bevel angle, usually between 30-40°.

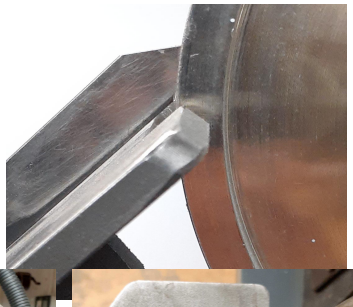
Video: https://www.youtube.com/watch?v=7nHgJ5aFOrc

5.2. Swept back grind: This shape is normally sharpened using a jig, very much like the bowl gouge.

Video including reshaping the gouge: https://www.youtube.com/watch?v=CheSEXBQNFk

6. **PARTING TOOL:** Parting tools have a bevel on each side and a narrow cutting edge. They are normally used to separate (part off) a piece of turning or cut grooves to establish diameters that the workpiece will be shaped to. The exact included angle (sum of the two bevel angles) at the cutting edge is not critical with 50º to 60º being the most common.

   There are two basic ways to sharpen a parting tool:

   6.1. **In line with grinder wheel:** The tool is placed on a platform that is set on an angle so that the bevel to be ground is placed against the wheel (see photo). Grind the bevel on this side, then rotate the tool 180º and grind the opposite bevel. This method requires some skill to keep the cutting edge at 90º to the shaft. Avoid grinding to a fine point, especially if using a 6" wheel.

   6.2. **Right angle to grinder wheel:** Set the platform so that, when the parting tool's side is placed flat on the platform, the centre of the tip is directly in line with the centre of the grinding wheel. Set this up with a straight edge (see photo).Grind one edge then flip the tool over and grind the other edge. The tool handle must always point in the same direction. The cutting edge will now be exactly 90º to the tool shaft. The cutting edge, and the side grind will also have a slightly concave surface which reduces grain tear-out and helps to control binding when cutting deep grooves.

7. **SKEW CHISEL:** Skew chisels come in a variety of shapes and sizes; round, rectangular, square (aka beading/parting tool), oval and even spear shaped. When purchasing rectangular shapes, choose only those which have rounded edges. Square edges make it harder to 'roll' the tool when cutting and can damage tool rests. If you have one with square edges, relieve the corners by grinding them slightly rounded, and use Aluminum oxide sandpaper to smooth the edge after the grinding is done.

   Included angle: For rectangular, square or round shaft types, the included angle can be between 30º and 40º. Oval type included angle can be between 25º and 35º. A rule often quoted: "the length of the bevel should be 1.5 - 2 times the thickness of the skew". Working out the math for rectangular skews, this will result in an included angle between 30 -39°.

   Skew angle: For rectangular, square or round skew chisels, the skew angle can be anywhere between 0º and 30º. Spear type skews can have an angle approaching 70°. The skew angle for oval skew chisels are normally between 20º and 30º.

   Cutting edge shape: This can be straight, slightly curved, straight to one point, curving to the other point or even curved from point to point. Note that oval skew chisels do not perform well with a curved edge.

   Sharpening skew chisels: Skew chisels can be sharpened using a platform rest to hold the angle of the tool to the grinding wheel or using a 'pocket' for the end of the handle while the edge rests on the grinding wheel. When using either method, use very little, if any, pressure on the tool against the wheel. Oneway and Rikon make a jig that mounts in the Wolverine arm to hold the tool at an angle to the wheel so that the edge is sharpened at a right angle to the wheel.

   Video: curved & straight edges: https://www.youtube.com/watch?v=teQrjYDh7Z0

8. **SCRAPERS:** Scrapers come in a myriad of shapes, sizes and configurations.

   Traditional scrapers: These have a flat 'top' which is the cutting edge with the bevel angled to the 'bottom' of the tool. Recommend angle is between 50º and 80º. A 'burr' created while sharpening, honing, or burnishing becomes the cutting edge.

Sharpening traditional scrapers: Regardless of the shape of the cutting edge, the tool is rested on a platform with the top of the cutting edge presented to the grinding wheel. This results in a ‘burr’ forming along the cutting edge which actually does the ‘cutting’. To form a very fine burr, first use a hone across the top of the scraper to remove any existing burr. Follow this up with a fine diamond 'card' placed flush against the ground face and moving it ‘up’ towards the top cutting edge. Using a burnishing tool, like those for cabinet scrapers, can create a distinct burr that makes a scraper ‘cut’ more aggressively.

Scrapers, with shaped cutting edges are also made for specific purposes. To keep the shape intact, sharpen by first honing the top to remove the worn burr, then make a new burr with a fine diamond 'card' placed flush against the face and moving it 'up' towards the top cutting edgs.

Negative rake scrapers: Negative rake scrapers are ground on both the ‘top’ and ‘bottom’ of the cutting edge to create an included angle similar to a skew chisel. Yes, a skew chisel can be used as a negative rake scraper. . .

What is the best included angle? I use 30º for both top and bottom – this makes for an included angle of 70º. This angle was chosen as it works well and involves the minimum of grinding when converting a standard scraper to a negative rake type.

As with any tool grind, different turners prefer different negative rake included angles. An included angle greater than 80º will not perform well. On the other hand, a smaller included angle provides a finer finish but a more aggressive tool.

Cindy Drozda suggests 75º or less, and Stuart Batty uses a 50º included angle.

Sharpening negative rake scrapers: These are sharpened very similarly to skew chisels, except that the included angle is larger. The simplest way to achieve an included angle of 70º is to set up the grinding platform to form an angle of 30º on the tool. Grind one side, then flip the tool over and grind the other side. Once the shape is completed, you do not have to sharpen both sides on each trip to the grinder. Simply grind the ‘bottom’ to resharpen and only grind the ‘top’ when necessary to keep the top bevel reasonably wide. Remember that you want the ‘burr’ to be on the top of the tool, so sharpen the ‘bottom’ last to ensure that the ‘burr’ is on the correct side of the cutting edge.

Stuart Batty video that includes sharpening negative rake scrapers (near the end of the video): https://stuartbattytools.com/free-videos-%26-articles#11a33c77-bf25-4de7-9257-fd1dbc667a1c

Here is an excellent video by Cindy Drozda showing various types of negative rake scrapers and how to sharpen them: https://www.youtube.com/watch?v=uZ5kqiT3FE0

9. **CARBIDE TOOLS:** All carbide tools are, essentially, scrapers. They are very useful for those who do not wish to invest in sharpening equipment. They do not remove material as quickly as conventional woodturning tools, but do have practical applications for specific uses. To ‘sharpen’, rotate the tool bit to expose a fresh area. When all edges have been dulled, the bit is replaced. Resharpening can be done on tool bits that have a 'flat' top by running the top across a fine diamond card. Bits that have an included angle can only be sharpened by 'grinding' the bevel to restore the edge. This can be difficult if the proper equipment is not used.

Richard Pikul 230923

APPENDIX

1. How I set the Oneway 'Vari-Grind' jig angles for shaping my bowl or spindle gouges:

- When adjusting the leg angle, the lower the angle between the leg and the inserted tool, the less will be the sweep to the bowl gouge side wings. A gouge sharpened with the leg almost parallel to the inserted tool will produce a narrow, tight bevel edge along the cutting tip. A gouge sharpened at the maximum angle between the leg and the inserted tool will have long pulled back wings.
- The tool being sharpened must stick out in front of the jig. To preserve a consistent shape, the distance must be the same each time a particular tool is sharpened. Oneway recommendation is between 1 3/8" and 2" (35-50mm) with the ideal being 1 3/4" (45mm). The exact dimension is not critical but it should be the same every time you regrind the tool. I prefer 1 3/4" (45mm).
- A 50º angle between the Vari-Grind leg and the inserted tool can be used for sharpening both bowl gouges and spindle gouges – if – both are sharpened to a swept back shape. It works well for bevel angles between 25º and 65º.

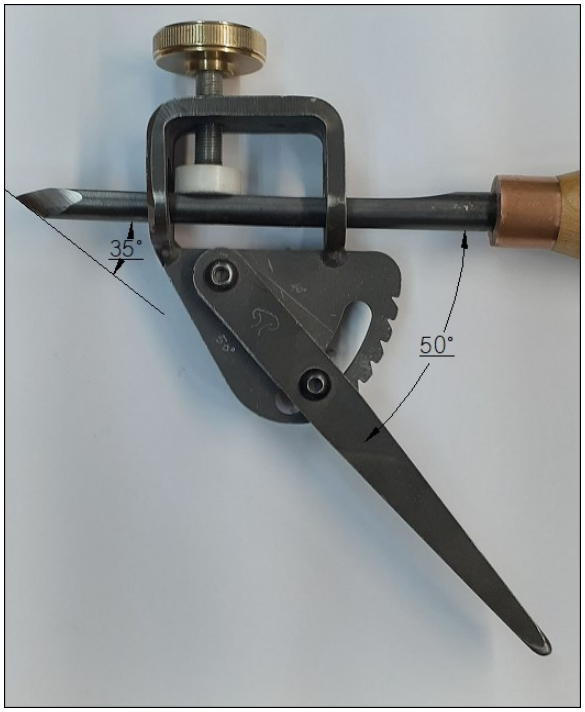
  After setting the 50º angle and adjusting the tool to stick out to 1 3/4" (45mm), place the jig, with it's bevel coloured with a black marker, in the Wolverine arm pocket and adjust the arm until the gouge bevel matches the grinding wheel. Turn the wheel by hand and see if the bevel matches, confirmed if the black marking is removed evenly across the bevel. If it does not, adjust the arm and test again until it does. Note that this setup assumes that the bevel on the gouge is 'correct'. If not, first grind the correct bevel angle on the tool using a platform or arm to hold the gouge.
- Now you can grind the tool. **Remember that the jig, on its own can only maintain the bevel, it is up to you to grind the shape.**

  Video showing how to start from scratch to reshape either a bowl or spindle gouge:
  https://www.youtube.com/watch?v=CheSEXBQNFk

Photo showing my varigrind jig set up to sharpen a spindle gouge. Spindle gouge bevel; 35 degrees.

The same varigrnd jig setup is used for my bowl gouges, except that the bevel angle is sharpened at 60 degrees.

I use 45mm (1.75") tool stick out.



2. **Recommended Videos:** (in no particular order)

Thompson Tools: Video showing theory and practise on turning tool sharpening
https://www.youtube.com/watch?v=ttYyulsM7wg&t=2s

Wyoming Woodturner: Sharpening bowl gouge, traditional shape:
https://www.youtube.com/watch?v=wncWJQHdlJg

Carter and Son Toolworks: Bowl gouge shapes:
https://carterandsontoolworks.com/pages/bowl-gouge-grinds-and-flutes

Cindy Drozda: Sharpening negative rake scrapers:
https://www.youtube.com/watch?v=uZ5kqiT3FE0

Ron Brown: 40/40 grind for bowl gouges:
https://www.youtube.com/watch?v=dcFIZ5Bx4t8

Reshaping and sharpening a bowl gouge:
http://www.youtube.com/watch?v=SoRLvTkXmzw

Peter Miao: 40/40 grinder jig:
https://www.petermiao.com/news/2017/11/11/a-jig-for-4040-grind

Richard Raffan: Asymmetrical bowl gouge grind:
https://www.youtube.com/watch?v=cnNBBV19YLw

Craft Supplies USA: Sharpening skew chisels:
https://www.youtube.com/watch?v=teQrjYDh7Z0

Richard Raffan: Sharpening a spindle gouge:
https://www.youtube.com/watch?v=7nHgJ5aFOrc

Timbecon Turning: Spindle roughing gouge, sharpening on a platform:
https://www.youtube.com/watch?v=776N-lr0D8g

Acutabove Woodworking: Spindle roughing gouge, sharpening with a ‘V’ arm:
https://www.youtube.com/watch?v=DrtTYyNYw4k

Richard Raffan, types of spindle roughing gouges:
https://www.youtube.com/watch?v=rA0MaWollv4

Mike Waldt, reshaping a spindle gouge:
https://www.youtube.com/watch?v=CheSEXBQNFk

Jim Ballard, swept back grind for bowl gouge:
https://www.youtube.com/watch?v=yfjBdenzxOQ

Stuart Batty, 40/40 grind – includes sharpening other tools
https://www.youtube.com/watch?v=nKxy2t0htpY&t=1s

Stuart Batty, link to a list of videos on 40/40 grind and how to use it:
https://stuartbattytools.com/free-videos-%26-articles#11a33c77-bf25-4de7-9257-fd1dbc667a1c

3. **Recommended articles:**

Carter and Son Toolworks, Bowl gouge grind shapes:
https://carterandsontoolworks.com/pages/bowl-gouge-grinds-and-flutes

Kent Weakley, Bowl gouge shapes, sizes, grinds:
https://turnawoodbowl.com/bowl-gouge-basics-beginner-guide

Kent Weakley, 40/40 grind for bowl gouges:
https://turnawoodbowl.com/40-40-bowl-gouge-grind-shape-sharpen-use/

Kent Weakley, Sharpening scrapers:
https://turnawoodbowl.com/scraper-sharpening-bevel-angle-burr-how-to/