

Knife 101 Workshop



Outcome

1. A complete drop point knife
2. Knowledge of materials and consumables used
3. Familiarization with scale materials and attachment
4. Safe use of a small Belt Sander

Assumptions

Little or no knowledge of knife materials, parts, knife construction methods or experience.

Safety

Safety glasses or a face shield for eye protection – absolutely !

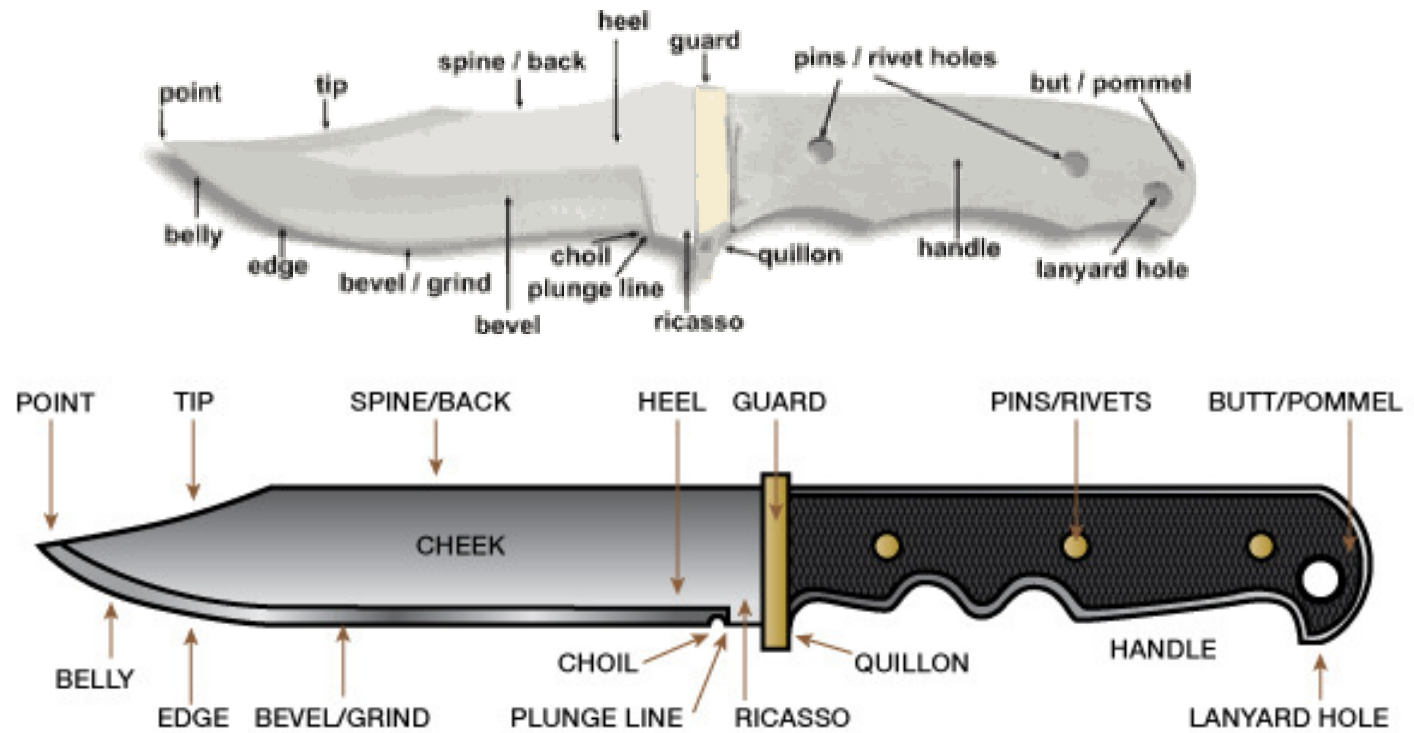
A Dust Mask to protect your lungs from inhaled dust – absolutely !

Gloves, heavier, for protecting your hands from abrasives and heat – optional.

Gloves, latex or nitrile, for protecting your hands from epoxy – optional, but recommended.

Hearing protection – optional, but the grinding/sanding can get a little loud.

Knife Parts



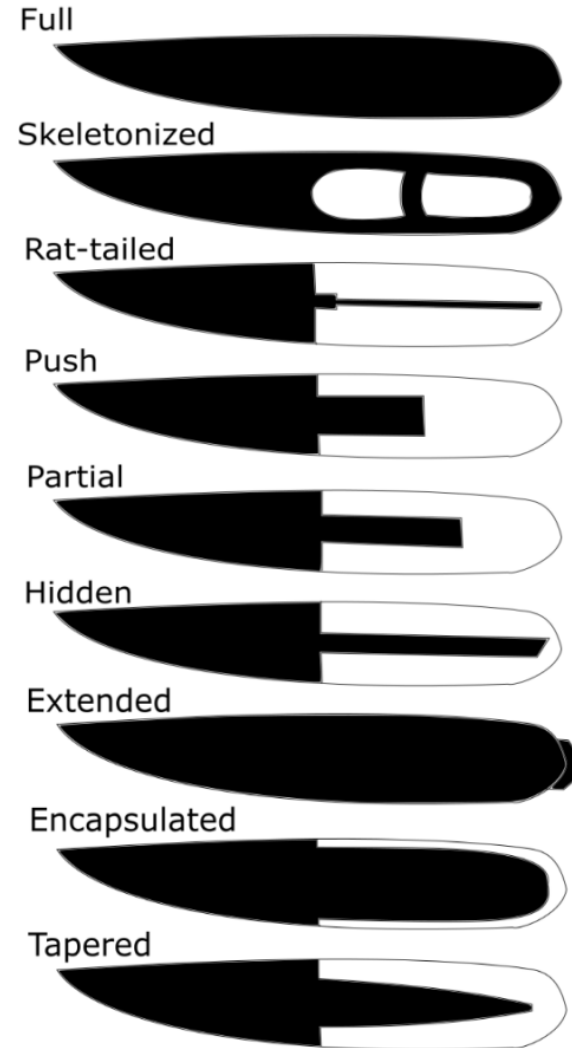
A Bolster is a fattened section of the blade between the blade and the handle

Tang

Handle is also called the Tang

It can have many different forms

The back, or spine of the knife can have decorative 'back work'



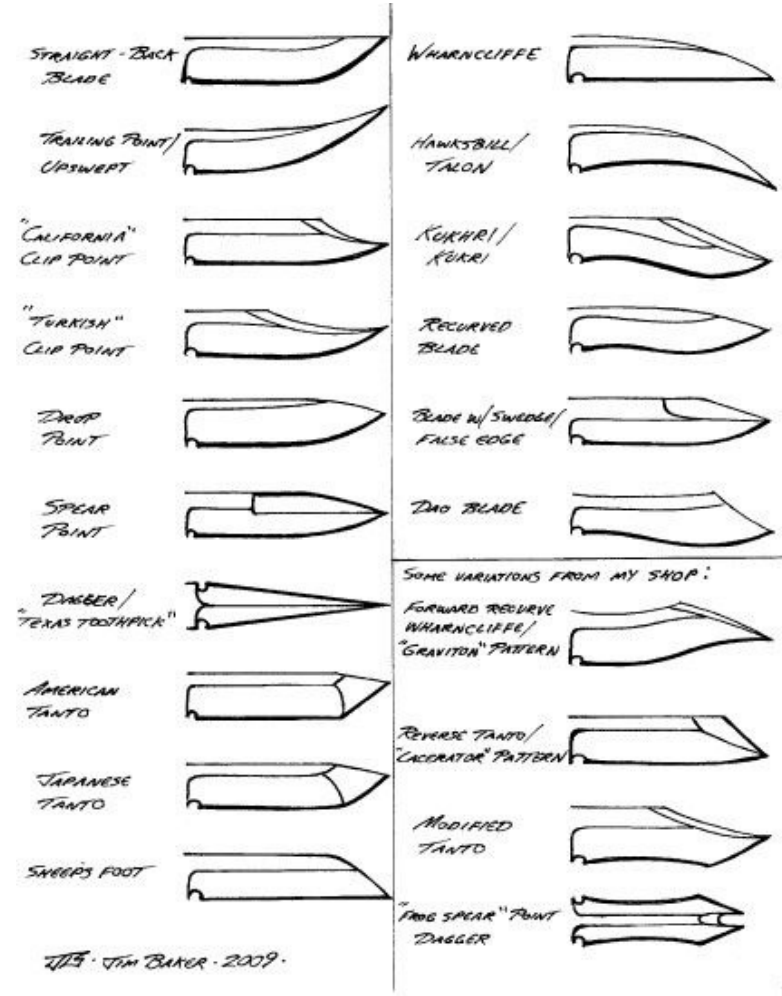
Knife Styles

There are lots of recognized styles, and many many more unique, fantasy, exotic, and original styles. Anything you can imagine.

And, there are different interpretations of the styles.



Knife Styles



TJB · TIM BAKER · 2009 ·

Knife Blank

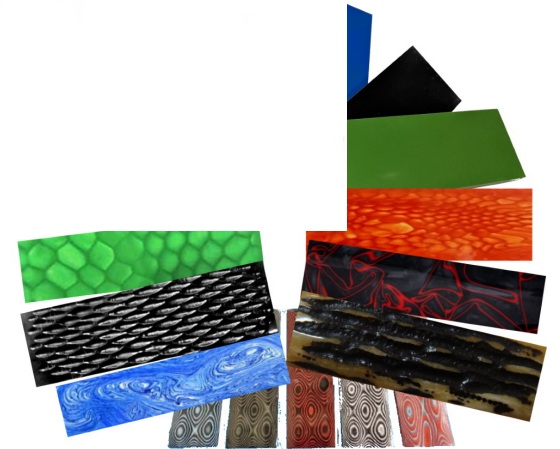


Scales

Scales are the pieces of material used to fatten up the handle to make the knife easier to hold and wield.

Available in natural and man made materials.

May also use wrappings or stacks of various materials.



Pins

Help to attach the scales to the handle. (Used to be they were all that held on the scales. Put through and then the ends fattened. These days we have modern epoxies that hold better. Pins are now mostly decorative.)

Can be plain metal (commonly brass), Chicago screws, or fancy (mosaic pins).

You can also make your own.



Belt Grinder

You could use files, stones, and sandpaper

A belt sander/grinder is much faster

Absolutely use Safety Glasses and a dust mask,
Gloves are optional, but protect hands from
abrasion and heat

Common sizes are 1 x 30 and 2 x 72

There are multiple grits of abrasive belt available

Smaller numbers are more coarse

Common Grits are 24, 32, 40, 80, 100, 120, 320,
400, 600, 800, 1000, 2000, 5000, 10,000

Used to shape the blade and the Scales.

The belt cuts steel at a reasonable rate.

It cuts wood quite quickly.

It cuts fingers and skin really fast.



Belt Grinder

Start with a coarse belt and work to finer grits.

40 grit to shape the Scales

80 grit for final shaping and smoothing

120 grit in preparation for hand sanding

Steel sands more slowly than wood. Be careful not to sand away too much wood next to the steel, and be careful about getting the steel too hot.

Be careful around polished metal parts to avoid scratching them.

Use 220 sandpaper by hand for final finishing.



Abrasives

A brief word about Abrasives:

When using abrasive products on machines things will get hot (really hot !)

With Coarser Grits, the heat tends to leave that material in the sparks and grindings

With Finer Grits, the heat tends to stay in the object

You will notice that things get hotter faster at 400 grit than they do at 40. It is easy to burn the wood with finer grits.

Dust:

The most common abrasive we use is Aluminum Oxide. It is hard, sharp and does a pretty good job. It is not good, but not particularly bad for you.

Another common abrasive is Silicon Carbide. It is really hard, really sharp, and grinds really fast. However, Silicon Carbide dust is **REALLY BAD** for your lungs. It will kill you. Absolutely wear a really good dust mask.

Drilling Scales

Use can your knife blank as a guide for drilling holes. We also have a drilling jig that make it easier to get the holes in the right spot and perpendicular to the tang.

Use a brad point drill and a block under the scale to keep the drill from 'tearing out' wood as the drill goes through.

Put both scales together the way they will fit on the handle

Use clamps

The last thing you want to happen is for your blade to get stuck on the drill bit and become a high speed food processor !



Epoxy

Used to attach the Scales to the Handle.

It is a really strong glue

Does most of the structural work.

Can be colored.

2 parts

Mix 1 to 1 (usually, the same amount of each by volume)

Squeeze out equal parts, about quarter sized, onto cardboard, mix for 1 minute with a tongue depressor.

Apply to *cleaned* tang/handle and scales.

Assemble and use clamps to hold everything in place.

Sets in 5 minutes – so, be ready.

Epoxy is a chemical reaction. It does not dry, it cures.

(Most folks have no allergic reaction to epoxy. But, you can develop a sensitivity to it over time. Be safe, use gloves. Besides, epoxy is thick and sticky and hard to get off your fingers.)



Polishing

We use abrasives to polish surfaces

All abrasives remove material but leave a scratched surface

When the scratches get too small to see we say something is polished

You will spend more time with coarser abrasives

Use each grit until scratches from the previous grit are no longer visible

Depending on the material, shiny or reflective starts at about 800 to 1000 grit

Mirror polish is hard to do and will show every defect. Avoid if possible. But, if done right it's beautiful.

If you are going for a shiny reflective surface, a random orbital sander is a recommended tool.

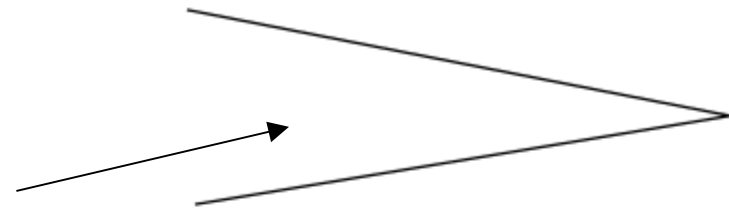
For final hand sanding, wrap the polishing paper around a slat (like a heavy duty paint stirrer) of wood with some leather glued to it.

You can buff with very fine rouge, machine polish, or diamond paste.

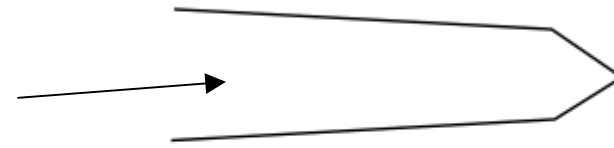
Sharpening

Different grinds on the sharp edge

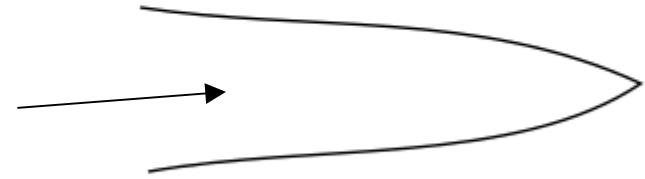
Sharp but needs regular sharpening,
wedges through the material



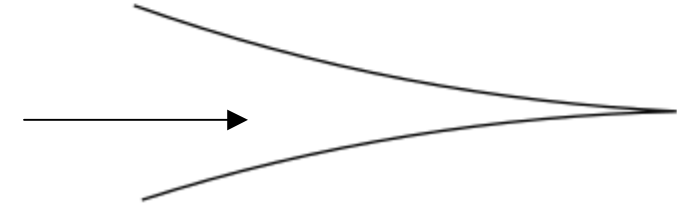
Chisel, does not cut as easily but lots of
support for the edge.



Compromise. A sharp edge and support
for the edge



Cuts easily, but not much support for the
edge. Needs to be sharpened often.



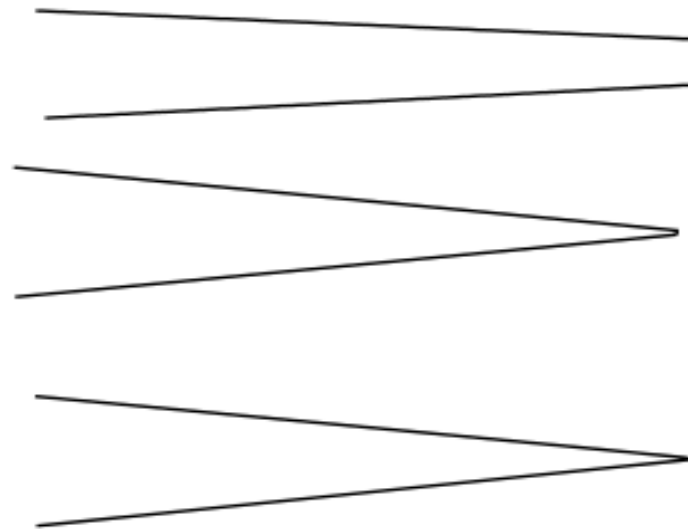
Sharpening

As you grind the edge gets thinner and thinner

At some point, the metal gets so thin you could refer to it as steel foil

The thin foil is not rigid enough to support itself, so it curls up creating what is called a burr.

This burr is stropped off (wiggled back and forth until it breaks) leaving a very thin sharp edge. This edge can be polished.



Enlarged tip
(still blunt).

Thin foil to be
stropped off

Hard vs. Annealed

Your knife blank is already Hardened and Tempered.

Carbon is the stuff in steel that makes it hard.

Need at least 0.40 % carbon for steel to be hardenable.

Hard steel is a particular molecular crystalline form of steel, which has many crystalline forms.

Steel that is allowed to cool slowly adopts the softest crystalline form. This is called the Annealed state.

It is easy to work and cut in this form, and thus, easy to shape (easy is a relative term.)

It is also very 'ductile', it can be bent without breaking.

It can be brought to a sharp edge, but because it is soft(ish) it will not hold or keep that sharp edge very long. It would need constant sharpening.

As steel is heated, it changes its molecular crystalline structure.

Some of these crystalline forms are very hard.

Hardness is measured in Rockwell Numbers. Bigger numbers are harder (and more brittle)

Hard vs. Annealed

If you heat steel up to a particular 'critical' temperature, it will adopt one of these very hard crystalline structures.

It's hard to think about it this way, but hot steel is a solution – like a very hot, very thick liquid.

So, your steel is at this critical temperature, and has adopted the very desirable hard crystalline structure you want.

But, if you let it just cool down slowly from that point, the crystalline structure will slowly change back to the soft annealed state.

So, how to keep the steel in its hard form?

We want to freeze it in that form.

To do that, we quench the steel – cool it very fast so that it does not have the chance to change back to the annealed state.

We now have hardened steel.

But.....

Hard vs. Tempered

This hardened steel is 'very' brittle.

If you drop it, it will likely shatter like glass.

If you stress it, like trying to pry something, it will easily break.

To solve this problem, we 'Temper' the steel.

The steel is placed in an oven at a relatively low temperature, on the order of 400 to 500 degrees, and allowed to soak at that temperature for a few hours.

This 'draws back' the hardness.

It allows the steel to keep most of its hard characteristics and at the same time regain some ductile properties – it will bend without breaking.

This gives the ideal qualities for a knife.

Strong, durable, and will hold a sharp edge for a long time.

Steps

- Wrap the blade end of the knife in tape to protect it and you. You can add some additional 'padding' to the sharp edge if you like.
- Select your scale material.
- Fit the front end of your scale material to the guard (flat and flush)
- Use the tang/handle of the knife as a guide to drill holes in your scales, or use the drilling jig.
- Clean the knife handle/tang with Acetone.
- Mix your epoxy and apply.
- Fit your scales to the handle/tang and install your pins.
- Clamp and let epoxy cure.
- Use belt sander to shape and start to smooth the scales. Start with 40 grit, to remove the bulk of the material and start your shaping. 80 grit to refine the shape, and 120 grit to smooth everything out.
- Use hand sandpaper to smooth your scales and prepare for finish.
- Remove tape.
- Finish Scales with your choice of finish.

Other Tips

Save final sharpening for last.

When grinding steel, go easy and cool the blade often. (High heat is the enemy of epoxy and can cause the glue to fail.)

Wood sands faster than metal

Link to 2 x 72 grinder video

<https://www.youtube.com/watch?v=AV56w-p8QfY>

Materials

Woodcraft – has a small supply of knife blanks and pin materials.

Jantz Supply – full line of supplies

Alpha Knife Supply – full line of materials

New Jersey Knife Barron – knife steels

Texas Knifemakers Supply – full line of supplies

Smokey Mountain Knife Works – blanks and complete knives

Speedy Metals – tool steels

Tru-Grit – grinding belts

Combat Abrasives – grinding belts

Many others

Advanced Workshops

Knife 201 – starting with a cut out blank of knife steel. Grinding, shaping, hardening, tempering, scales, finishing.

Knife 302 – starting with a *chunk* of knife steel, Forging, grinding, hardening, tempering, scales, finishing

Sheath – Making a leather sheath for your knife

