

Saw Sharpening Presentation Notes

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Introduction

Focus is on western saws that cut on the push stroke without hardened teeth

- Most saws sold today have hardened teeth, the teeth have a blue-ish color

When to sharpen

- the teeth are uneven and don't seem sharp to the touch
- the tips of the teeth are rounded
- takes a long time to make a cut (relatively speaking)

When to set the teeth

- won't follow a line
- binds in the cut

When not to sharpen

- If the teeth are regular and even, and "grab" the palm of your hand slightly when you push against them

Terms and graphical orientation

Terms

- Pitch
 - measure of the number of points or teeth that fall within one inch
 - Teeth Per Inch (tpi)
 - Measured from bottom of gullet to bottom of gullet
 - Points Per Inch (ppi)
 - generally +1 points over the tpi
 - measured from tip of tooth to tip of tooth
- Rake angle
 - how much the cutting edge of the saw tooth is sloped back from perpendicular.
 - the most common rake angle for crosscut saw is 15 degrees.
 - In general, the steeper the rake angle, the more aggressive the saw will cut.
- Fleam angle

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- Fleam is the angle across the face of the tooth or perpendicular to the tooth line.
- By adding fleam, the teeth of a saw are turned into little knives.
- Rip saws typically have 0 degrees
- Crosscut saws generally use 20 degrees
 - 24 degrees, works great if you work primarily in soft woods
 - 15 degrees, you will have an edge that is more durable, but producing a finish that is rougher
 - Smaller teeth, 12 and up, are harder to file the higher the fleam angle. Since they are so small to start with, not much is gained by using a high fleam angle like 24 degrees.
- Slope angle
 - Not covered
- File cuts
 - Single cut
 - teeth that stretch across the width of the file, cut in parallel rows
 - well suited to finishing, deburring and sharpening
 - Double cut
 - are cut twice, in two rows of parallel lines.
 - The first cut, which is made in the same way as a single cut file, is called the overcut.
 - second cut, which is made at an angle to the initial cut, is called the up cut and usually a finer cut
 - used with more pressure to quickly remove unwanted material.
Best suited to shaping an object
 - **Files along with rasps are useful in woodworking**
- File coarseness
 - Can be measured in teeth per inch
 - Usually measured in two systems: Swiss pattern and American pattern
 - Swiss pattern files use a numbering system that moves from the coarsest, 00, through 0, 1, 2, 3 and 4, to 6, which is the finest.
 - American pattern files use a different system, using specific terminology. From smoothest to coarsest, these are: dead smooth, smooth, second cut, bastard and coarse.
 - Similarities in each measurement system
 - American 'bastard cut' is equivalent to Swiss 'grade 00'.
 - American 'second cut' is equivalent to Swiss 'grade 0'.
 - American 'smooth cut' is equivalent to Swiss 'grade 2'.

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- Jointing

Orientation

- Rip
 - Perpendicular to the saw blank – 0-8 degrees
 - No fleam
 - Vertical face on tooth
 - All teeth can be filed from the same side
 - Saw types
 - Dovetail - use for both rip and crosscut – 16 TPI – per PS
 - Tennon - use for both rip and crosscut – 11 TPI – per PS
 - Panel - use for both rip and crosscut – 11 TPI – per PS
- Progressive Rip
 - From Paul Sellers
 - First inch at toe, file slightly sloping forward (7-8 degrees)
 - Second inch at toe, file slightly more sloping forward (4-5 degrees)
 - Rest of the saw at traditional 0 degree rip pattern
- Crosscut
 - Essential on larger saws when cross cutting larger pieces
 - Applicable to smaller saws when cutting plywood or lots of cross cuts
 - Every other tooth filed from the opposite side of the saw
 - 60 degree face on tooth
 - Saw types
 - Carcass
 - Panel

Tools

Vice to hold the saw

used to hold your saw plate steady while you joint and file, grip the saw just under the bottom of the teeth

- Antique metal version
- Specially made
 - Recommend plans from R Cosman
- One stick each side of the saw in a vice
- Saw kerf down center of stick with drilled hole to stop splitting
 - Different lengths for different saws

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- Place in a vice to hold saw

Files

- For Jointing the saw teeth
 - Mill Bastard File
 - Veritas Jointer/Edger
 - Shop made jig to hold file perpendicular to saw blank
- In general, saw filing files common is four tapers: Regular, Slim, Extra Slim and Double Extra Slim.
- Characteristics of a good file for sharpening
 - Able to file a sharp equilateral triangle all the way to the corner edge
 - when each edge of the file is used, there should be no significant over or underlap among the three edges.
- Why different size files
 - Fit the different tooth sizes
 - should be able to easily see the teeth when you are filing
 - larger files do not come to as sharp an edge as smaller files
 - If you use a file that is too small, you will use the same middle section of each face, which will be dull right where you need it to be the sharpest.
Near the middle of each face is where the cutting edge of the teeth is sharpened.
- Recommended Triangular File Sizes
 - PPI File Size
 - 4 – 5 1/2 7-in. regular taper
 - 6-7 7-in. slim taper
 - 8 6-in. slim taper
 - 9-10 6-in. extra slim taper
 - 11 6-in. double extra slim taper
 - 12-14 5-in. double extra slim taper
 - 15-20 4-in. double extra slim taper
- Another file size table

• File Type	• PPI of Saw
• 8" Regular Taper	• 3-4.5
• 6" Regular Taper	• 5-5.5
• 7" Slim Taper	• 6,7

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• 6" Slim Taper	• 8
• 6" XSlim Taper	• 9,10
• 6" 2XSlim Taper	• 11-13
• 4" 2XSlim Taper	• 13-20

- Another file size table (Bad Axe)

<u>PPI</u>	<u>Size File</u>
16-17ppi	140mm
15ppi	160mm
14ppi	200mm
13ppi	4" xx-slim
12ppi	5" xx-slim
10-11ppi	6" xx-slim
9ppi	6" x-slim
7-8ppi	8" x-slim
5.5-6ppi	8" slim
4-5ppi	8" Reg
Jointing	10" Mill File

- Brands of files to consider:
 - Grobet files (also branded as “Vallorbe” and “Glardon” in some areas)
 - Bahco saw files
 - Friedrich Dick (from Bad Axe Tool Works)
 - Simonds saw files
 - Nicholson saw files aren’t as quality as they used to be

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- Life of a file
 - A full reshaping and sharpening generally takes the entire cutting edge
 - A light touch-up may get two sharpening per cutting edge
 - To remember which edges on a file are used up, I lightly dress the dull edge of the file on the grinder, removing the cutting teeth from the extreme edge.

Setting tool

- Spear & Jackson 94-370R Eclipse Saw Tooth Setter (Amazon)
 - Paul Sellers has an excellent video on YouTube that shows how this set can be adapted for 14-15 t.p.i. dovetail and other fine tooth backsaws
 - B. S. Kimerer describes his method in a review of the GreatNeck version of this product
- No. 42 and No. 42X pistol grip saw sets (choose the 42X)

Jointing / Trimming teeth

- VERITAS Jointer and Edger (File Holder)
- Mill Bastard File - 200 mm, cross-section 19 x 4.8 mm, cut 3,

Alignment jig

- Veritas Saw File Holder

Technique

Jointing / Trimming teeth

Leveling the tops of the teeth

- Restore cutting performance
- Similar to flattening a card file

Action

- place your saw in your saw vise so that about 2" of blade extends above the jaws
- use a 10" smooth cut mill file
- jointer jig optional
- Take the file and lay it on the saw teeth and the heel end of the saw

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- Grasp the file with both hands, using your forefingers as a guide on each side of the blade. Keeping the file parallel to the floor, rub the file once across the entire length of the blade
- Continue until all the teeth have been leveled to the same height.

Shaping teeth

File a rip or crosscut orientation until all the teeth are the same shape and the base of the teeth is in a neat line. Top of all teeth should come to a point.

Change rake angle to be less aggressive for very hard woods

The task is to ensure that the face of the file that defines the rake angle be kept as constant as possible. Allowing the file to follow the angle that is present on the tooth is a recipe for disaster. With repeated filings, the angle will gradually change to the point where the teeth need to be recut rather than refilled.

Action

- Put the saw in the vise so the handle faces the right and the toe of the saw faces the left.
- Place your saw in the vise so the gullets of the teeth clear the jaws by about 3/32" of an inch.
- Use of alignment jig to help maintain the proper rake angle.

Setting

There is some thought that if a saw is set before it is sharpened, then part of the set is removed when the teeth are filed. It is very difficult to try to figure out how much the set is decreased in filing as it is dependent on many factors such as how sharp the file is, how hard you bear on the tooth with the file, and how uniform the saw teeth are filed

Setting after sharpening may damage the sharpness.

Let's say we measure the saw in question and the blade is .035 inches thick. A good rule of thumb is to increase the thickness of the blade by 20% for dry hardwoods, and 25-30% for softwoods. So, our .035 blade would need to be increased to .042 inches for use in hardwoods, or up to .046 inches for softwoods and wood that is wet. This is just a guideline



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- makes the cut wider than the blade, so that the saw does not jam in the kerf
- a thin kerf keeps the saw tracking straight
 - need to start the cut straight
- generally, fewer tpi the more the set
 - dovetail, tenon, carcass about .002 set
 - panel ,003 set
- saw will take 3-4 sharpening before resetting is needed
- if too much set, file or sharpening stone the side of the saw, evenly on both sides
- don't try to bend a tooth the other way once it has already been set the opposite way

Sharpening

Try to make the same number of strokes on each tooth to stay uniform

Mark each tooth with a Sharpie so you know which teeth have been sharpened

Drag file, without pressure, back through cut, then reposition

Light to moderate pressure

- Rip
 - Focused on one surface, leading edge of tooth, at a time
 - Perpendicular to the saw blank (0-8 degrees)
- Crosscut
 - File each tooth from alternate sides of the saw
 - Sharpening the back of one tooth and front of another tooth at the same time (15-24 degrees)
 - Hold file at 60 degrees (marking angle when getting started)
- Popsicle stick trick to monitor angles

Re toothing

References

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Much of the material in this paper is sourced from the following references. Credit for this material should be given to the source. Please review these sources as much more information is located therein.

- Sharpening and Setting Sawblades <https://www.fine-tools.com/G10001.html>
- Saw Filing--A Beginner's Primer - **Highly Recommended** - <https://www.vintagesaws.com/library/primer/sharp.html>
- All about files - **Highly Recommended** - <https://www.wonkeedonkeetools.co.uk/files/what-is-a-file>
- Blackburn Tools – Saw Tooth Geometry <https://www.blackburntools.com/articles/saw-tooth-geometry/index.html>
- Wood and Shop - Saw Sharpening Supplies and diagrams <https://woodandshop.com/hand-saw-sharpening-tools-supplies/>
- Wood and Shop - How to Sharpen Hand Saws <https://woodandshop.com/how-to-sharpen-hand-saws-for-woodworking/>

Sources

Where to find saw sharpening tools.

- Grobet files <https://www.gesswein.com>
- Grobet files <https://www.micro-tools.com>
- Bahco files, alignment jig, jointing jig - Lee Valley <https://www.leevalley.com/en-us/shop/tools/hand-tools/files-and-rasps/files/69854-bahco-double-extra-slim-saw-sharpening-files>
- Fredrich Dick Saw Files https://badaxetoolworks.com/products/friedrich-dick-saw-files?_pos=1&_psq=saw+files&_ss=e&_v=1.0&variant=44724802027823
- Grobet Taper Saw Files https://www.msdiscounttool.com/catalog/index.php?cPath=3437_3523_4475_4476_4490
- Highland Hardware <https://www.highlandwoodworking.com/grobet-taper-files-for-hand-saw-sharpening.aspx>
- Amazon
- Ebay

Videos

- How to Sharpen a Woodworking Handsaw | Paul Sellers <https://www.youtube.com/watch?v=UA5DixEaaUo>

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- How To Sharpen A Crosscut Hand Saw | Rob Cosman
<https://www.youtube.com/watch?v=29Vsgvu3T6E>
- Saw Sharpening - Shopmade Saw Vise | Rob Cosman
<https://www.youtube.com/watch?v=rRRMogzFOrA>
- Saw Sharpening – Re-sharpen a Dull Rip Saw | Rob Cosman
<https://www.youtube.com/watch?v=6A9-4NqEMFY&t=54s>
- Jointing A Saw Blade | Sharpening Hand Saws | Rob Cosman
<https://www.youtube.com/watch?v=gYNJd0LRLOo>

Saw Specifications

Rob Cosman

Dovetail

- first two inches of each dovetail saw is filed at 22 teeth per inch (TPI) and a 30 degree negative tooth rake
- rest of the blade is filed at 15 tpi and a 5 degree tooth rake
- set of only .002 inch (per side)

Tenon Saw: Medium Size

- First 2" are filed rip at 22 TPI with a negative 30 degree rake
- remaining teeth are filed rip at 12 teeth per inch (TPI) and a 0 degree rake
- set of only .002 inch (per side)

Bench Crosscut

- Filed crosscut at 13 teeth per inch (TPI) and a 0 degree tooth rake
- set of only .002 inch (per side)

Lie-Nielsen Toolworks

Dovetail

- 15 ppi rip
- set at .003" per side

Tenon Saw

- Ground rip at 11 ppi

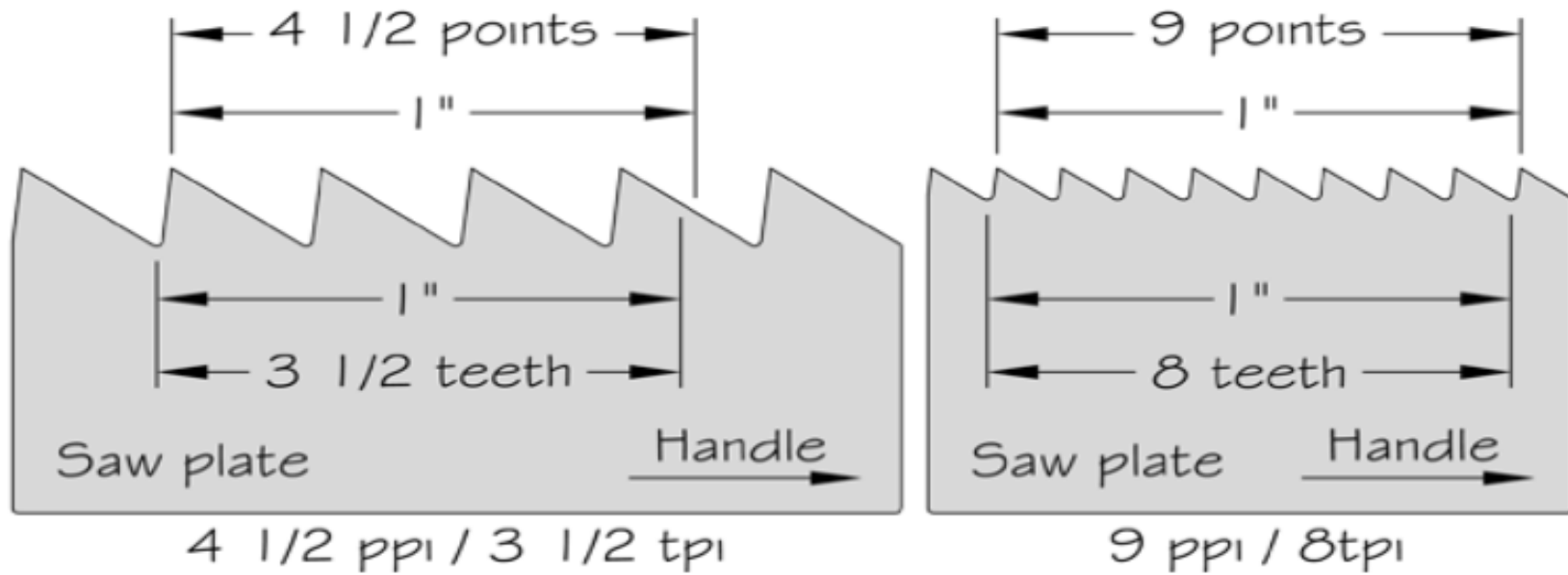
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- set at .004" (.10mm) per side

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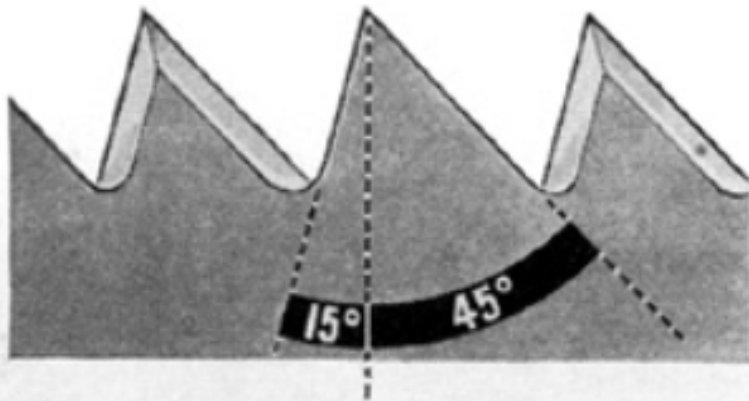
Pitch

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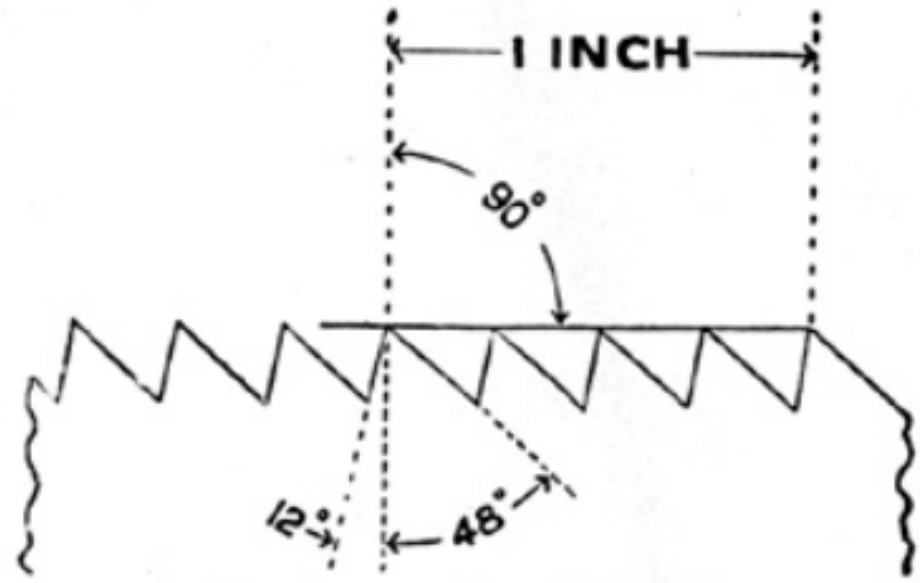
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THE CROSS - CUT SAW TOOTH

The angle of a cross-cut saw tooth is 60° , the same as that of a rip saw. The angle on front of the tooth is 15° from the perpendicular, while the angle on the back is 45° .



Side view of cross-cut teeth (enlarged)



Angles of crosscut teeth $\frac{1}{4}$ inch space
or five points to inch.

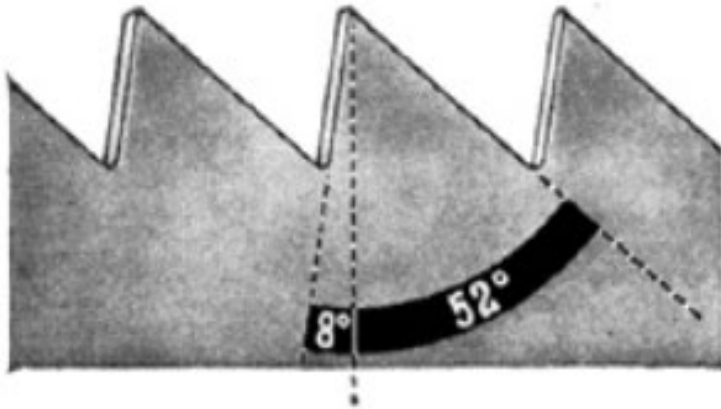
Crosscut Saw Tooth Shape

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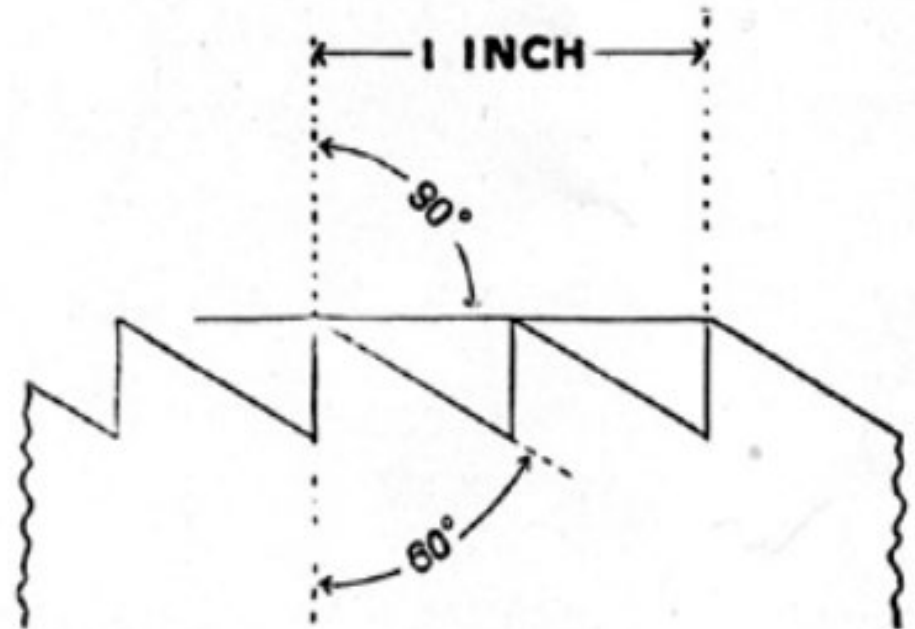
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THE RIP SAW TOOTH

A tooth of a rip saw has an angle of 60° — 8° from the perpendicular on the front, and 52° on the back.



Side view of rip teeth (enlarged)

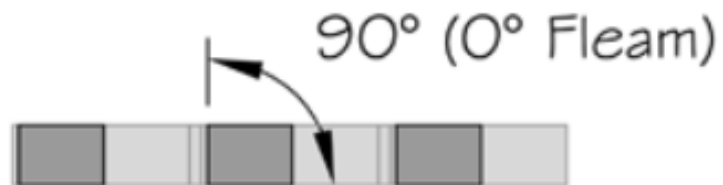
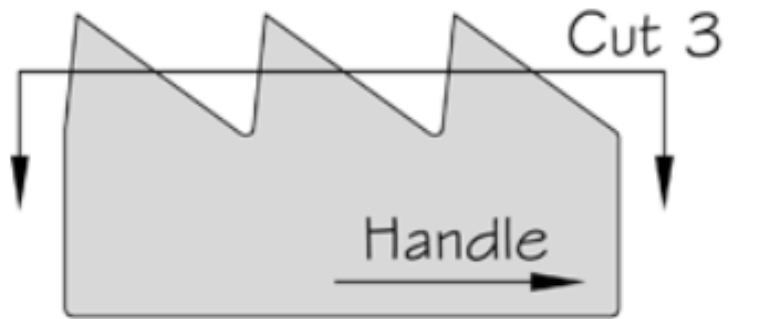


Angles of rip teeth $\frac{1}{2}$ inch space or three points to inch.

Rip Saw Tooth Shape

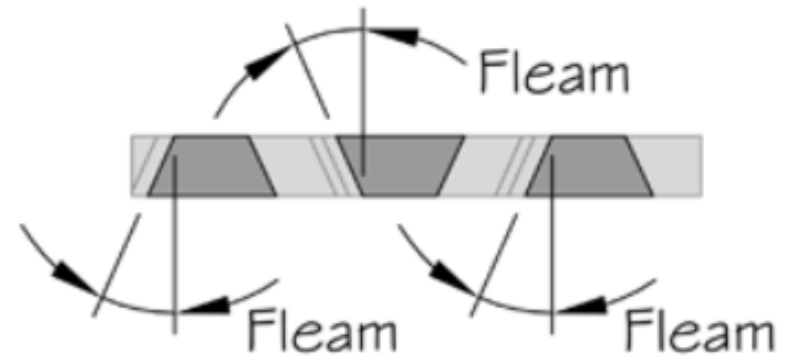
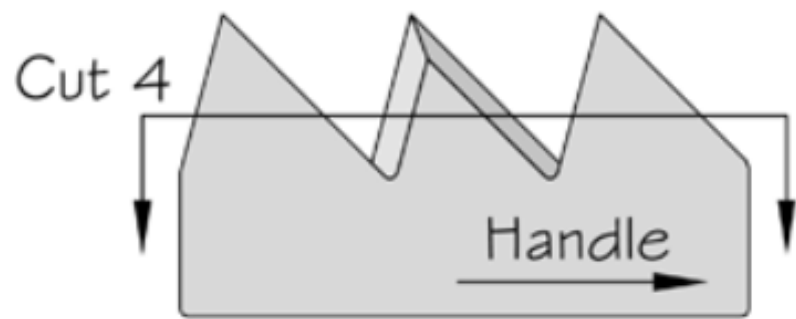
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Cut 3

Rip teeth - viewed
from the side & top



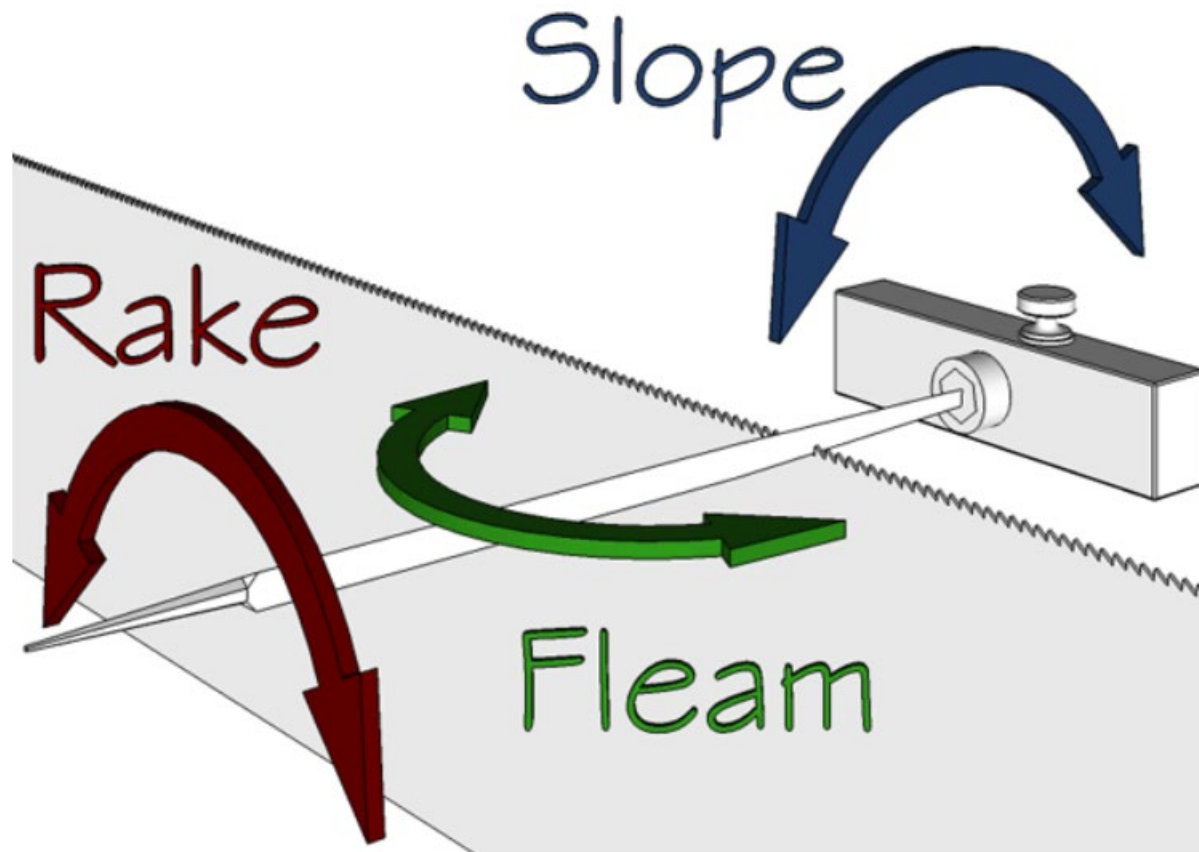
Cut 4

Cross cut teeth - viewed
from the side & top

Fleam Angles

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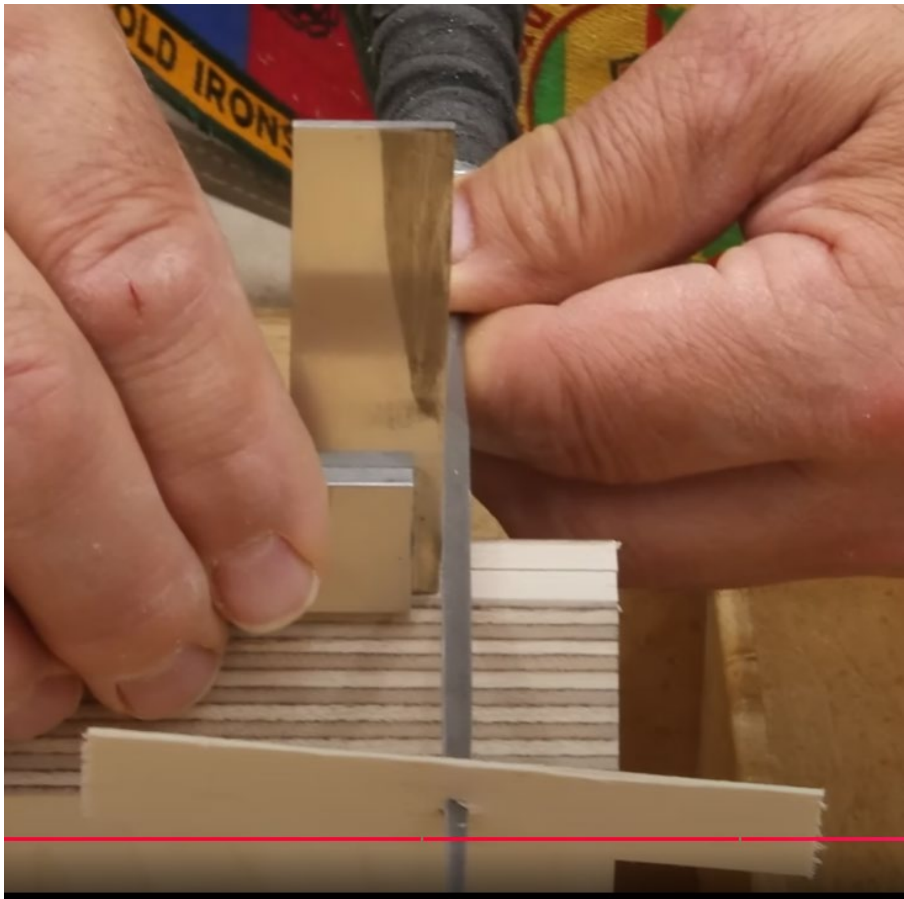
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File Set So Face of Tooth Perpendicular

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Add Stick For Visual Reference



File Stroke Perpendicular to Saw

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Rip Sharpening Stroke

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Set File Rake angle at 15 Degrees

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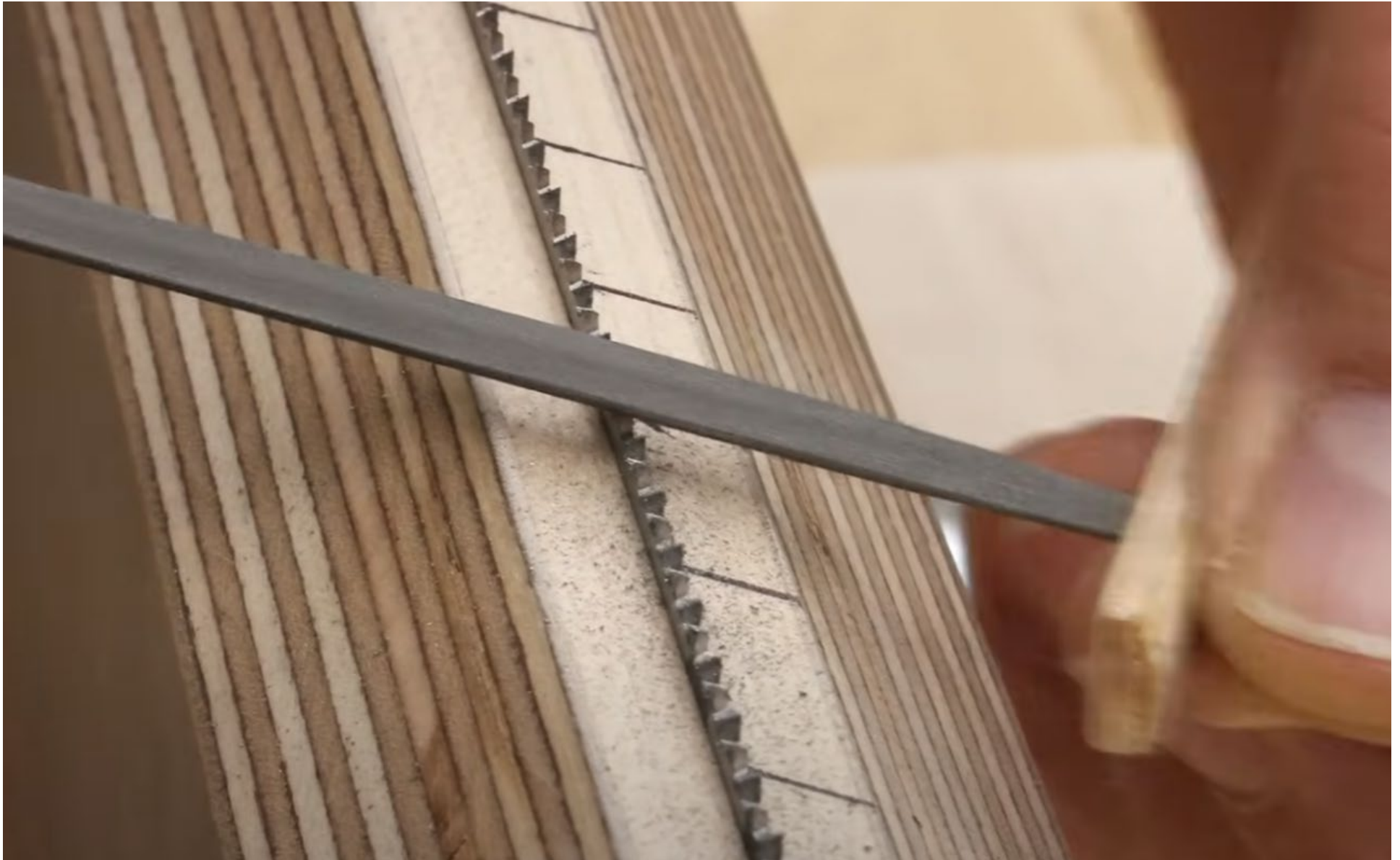
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Crosscut Sharpening Stroke at 60 degrees

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Crosscut Sharpening Stroke on Other Side of Saw

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Shop Made Jointing Jig

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