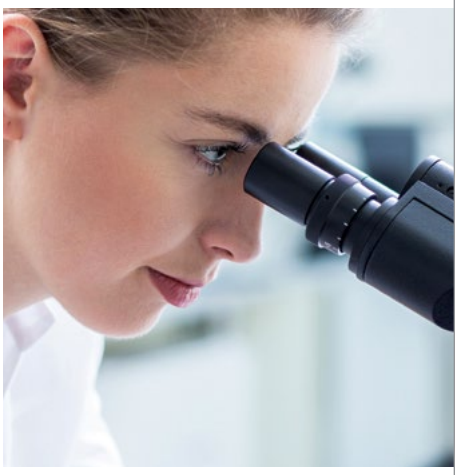
BLADE OPTIMIZATION

USING METAL CHIPS TO TROUBLESHOOT

You can improve the productivity of your metal cutting operation by paying close attention to the chips made by the blade cutting through metal. This chart shows some of the common problems that can be discovered and solved by paying attention to chips in a large variety of materials.

Chip Form	Chip Condition	Chip color	Blade Speed	Blade Feed Rate	Other
	Thick, Hard and Short	Blue or Brown	Decrease ↓	Decrease ↓	Check Cutting Fluid and Mix
	Thin and Curled	Silver	Suitable ✔	Suitable ✔	
	Powder	Silver	Decrease ↓	Increase ↑	
	Thin and Tightly Curled	Silver	Suitable ✔	Decrease ↓	Check Tooth Pitch



Blade Break-In

BLADE BREAK-IN: EXTREMELY IMPORTANT FOR MOST BLADES

The extremely sharp tooth points and edges of new blades must be broken-in before applying full feed pressure to the blade.

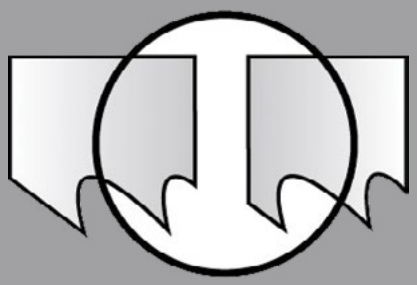
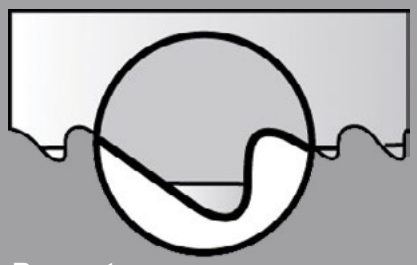
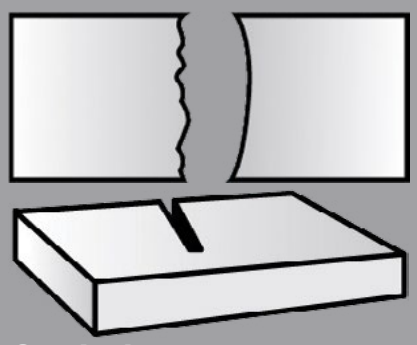
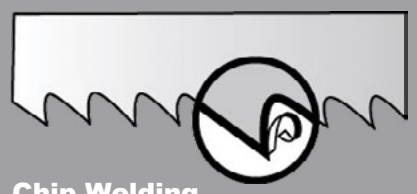
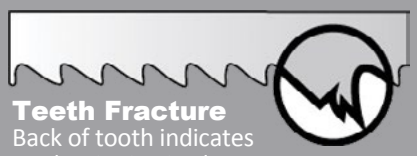
A good analogy is that of writing with a freshly sharpened wooden pencil.

**** Jawbreaker band saw blades are the exception and <u>should not</u> be broken in ****

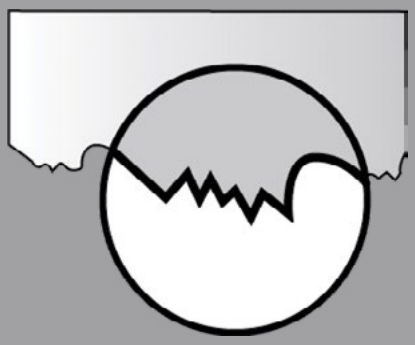
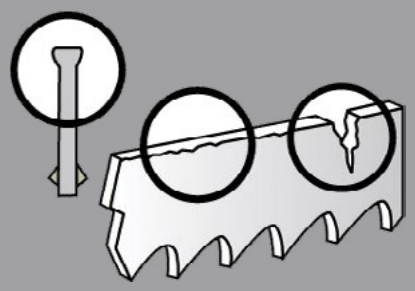
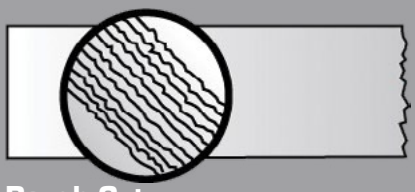
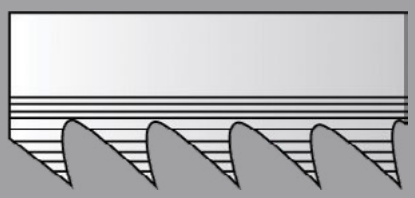
RECOMMENDED BREAK-IN PROCEDURE

- Maintain proper blade speed for the material to be cut.
- Reduce blade feed pressure or feed rate by 50% for the first 50 – 100in^2 or 322 – 645cm^2 of material cut.
- Gradually increase feed pressure or feed rate after break-in to target pressure or rate.

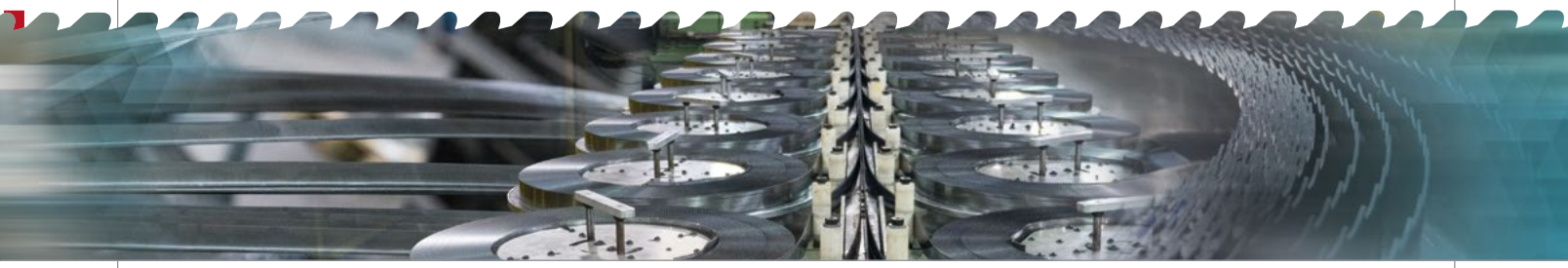
BLADE PROBLEM SOLVING

Problem	Problem Cause	Solution
 **Premature Blade Breakage** Straight Break indicates fatigue	▼ Incorrect tooth pitch ▼ Blade tension incorrect ▼ Side guides too tight ▼ Damaged or misadjusted blade guides ▼ Excessive feed/force ▼ Incorrect cutting fluid ▼ Wrong blade size for _____ ▼ Blade rubbing on wheel flanges ▼ Teeth in contact with work before starting saw ▼ Incorrect blade speed	▼ Use correct tooth pitch ▼ Check blade tension with Band Tension Gauge ▼ Check side guide clearance (see machine manual) ▼ Check all guides for alignment/damage ▼ Reduce feed pressure/force ▼ Check coolant/refract ▼ Use correct size blade ▼ Adjust wheel alignment ▼ Allow clearance before starting cut ▼ Increase or decrease blade speed
 **Premature Dulling of Teeth**	▼ Teeth pointing in wrong direction / blade mounted backwards ▼ Improper or no blade break-in ▼ Hard spots in material ▼ Material work hardened ▼ Improper coolant ▼ Improper coolant concentration ▼ Speed too high ▼ Feed too light ▼ Improper tooth count	▼ Install blade correctly. If teeth are facing the wrong direction, flip blade inside out ▼ Break in blade properly (Page 10) ▼ Check for hardness or hard spots like scale or flame cut areas ▼ Increase feed rate ▼ Check coolant type ▼ Check coolant/refract ▼ Check recommended blade speed ▼ Increase feed rate ▼ Select proper tooth size
 **Crooked or Out of Square Cuts**	▼ Tooth set damage ▼ Excessive feed pressure/force ▼ Improper tooth size ▼ Cutting fluid not applied evenly ▼ Guides worn or loose ▼ Insufficient blade tension ▼ Guide arms loose or set too far apart ▼ Chips not being cleaned from gullets	▼ Check for worn set on one side of blade ▼ Reduce feed pressure/force ▼ Check tooth size chart (Page 33) ▼ Check coolant nozzles ▼ Tighten or replace guides, check for proper alignment ▼ Adjust to recommended tension ▼ Position arms as close to work as possible. Tighten arms. ▼ Check chip brush
 **Chip Welding**	▼ Insufficient coolant flow ▼ Wrong coolant concentration ▼ Excessive speed and/or pressure ▼ Tooth size too small ▼ Chip brush not working	▼ Check coolant level and flow ▼ Check coolant ratio/refract ▼ Reduce speed and/or pressure ▼ Use coarser tooth pitch ▼ Repair or replace chip brush
 **Teeth Fracture** Back of tooth indicates work spinning in clamps	▼ Incorrect speed and/or feed ▼ Incorrect tooth pitch ▼ Saw guides not adjusted properly ▼ Chip brush not working ▼ Work spinning or moving in vise	▼ Check cutting chart (Page 34-35) ▼ Check tooth size chart (Page 33) ▼ Adjust or replace saw guides ▼ Repair or replace chip brush ▼ Check bundle configuration/adjust vise pressure
 **Irregular Break** Indicates material movement	▼ Indexing out of sequence ▼ Material loose in vise	▼ Check proper machine movement ▼ Check vise or clamp

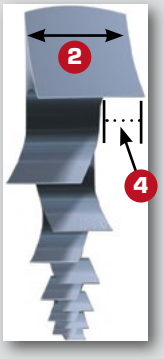
BLADE PROBLEM SOLVING

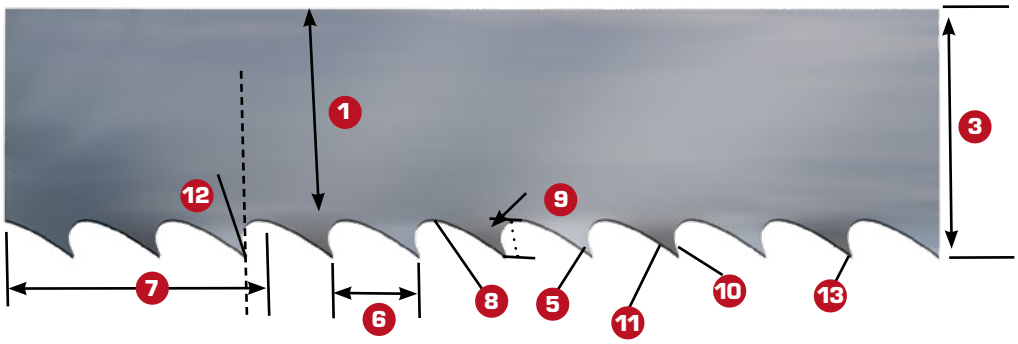
Problem	Problem Cause	Solution
 **Teeth Stripping**	▼ Feed pressure too high ▼ Tooth stuck in cut ▼ Improper or insufficient coolant ▼ Incorrect tooth size ▼ Hard spots in material ▼ Work spinning in vise - loose nest or bundle ▼ Blade speed too slow ▼ Blade teeth running backwards ▼ Chip brush not working	▼ Reduce feed pressure ▼ Do not enter old cut with a new blade ▼ Check coolant flow and concentration/refract ▼ Check tooth size chart (Page 33) ▼ Check material for hard inclusions ▼ Check clamping pressure - be sure work is held firmly ▼ Increase blade speed ▼ Reverse blade (turn inside out) ▼ Repair or replace chip brush
 **Wear on Back of Blades**	▼ Excessive feed pressure ▼ Insufficient blade tension ▼ Back-up guide frozen, damaged, or worn ▼ Blade rubbing on wheel flange	▼ Decrease feed pressure ▼ Increase blade tension and readjust guides ▼ Repair or replace back-up guide ▼ Adjust wheel alignment
 **Rough Cut** Washboard surface vibration and or chatter	▼ Dull or damaged blade ▼ Incorrect speed or feed ▼ Insufficient blade support ▼ Incorrect tooth pitch ▼ Insufficient coolant	▼ Replace with new blade ▼ Use correct speed and feed ▼ Move guide arms as close as possible to the work ▼ Use finer pitch blade ▼ Check coolant flow
 **Wear Lines, Loss of Set**	▼ Saw guide inserts or wheel flange are riding on teeth ▼ Insufficient blade tension ▼ Hard spots in material ▼ Back-up guide worn	▼ Check machine manual for correct blade width ▼ Tension blade properly ▼ Check material for inclusions ▼ Replace guide
 **Twisted Blade** Profile sawing	▼ Blade binding in cut ▼ Side guides too tight ▼ Wrong size blade ▼ Work not firmly held ▼ Erratic coolant flow ▼ Incorrect blade tension	▼ Decrease feed pressure/force ▼ Adjust side guide gap ▼ Use correct size blade ▼ Check clamping pressure ▼ Check coolant nozzles ▼ Check blade tension
 **Blade Wear** Teeth blued	▼ Incorrect blade ▼ Incorrect feed or speed ▼ Improper or insufficient coolant ▼ "Blueing" caused by excessive heat	▼ Use coarser tooth pitch ▼ Use correct feed and speed ▼ Check coolant flow ▼ Check coolant flow

ANATOMY OF A SAW BLADE



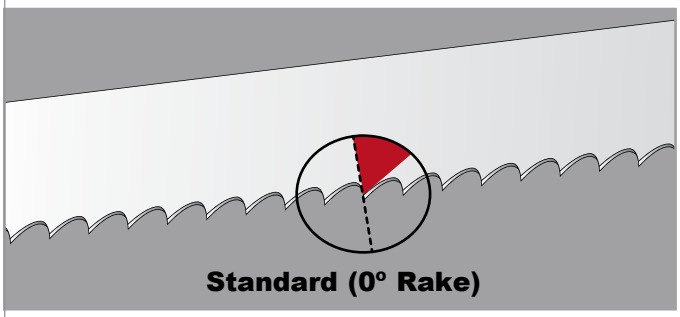
Although it looks like a flat piece of metal with teeth, a quality industrial band saw blade is actually a sophisticated cutting tool. Its ability to efficiently cut through tough metals, composite materials, plastics, and woods depends on a variety of interrelated factors such as the design, spacing and set of the teeth, the design and capacity of the gullets to make sure chips are efficiently removed, the composition of the backer strip, and the gage of the metal. These considerations must be taken into account when selecting the right blade for your application. The following Technical Pages will help you arrive at the perfect Morse solution to your particular cutting problem.

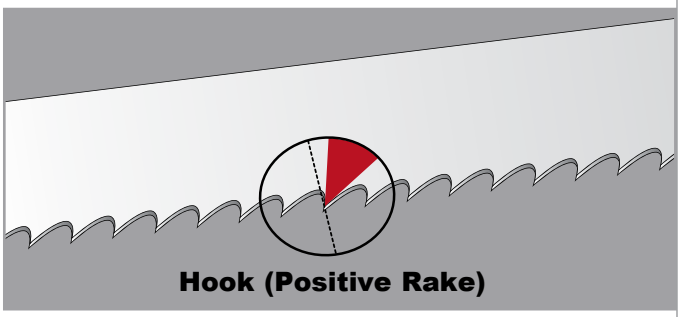




1. **Blade Backer** ..... The body of the blade not including tooth portion
2. **Gauge**..... The thickness of the blade
3. **Width**..... The tip of tooth to back of blade
4. **Set**..... The positioning of teeth right or left
5. **Tooth** ..... The cutting portion of the saw blade
6. **Tooth Pitch**..... The distance from one tooth tip to the next
7. **T.P.I.** ..... The number of teeth per inch measured gullet to gullet
8. **Gullet** ..... The curved area between the tooth points
9. **Gullet Depth** ..... The distance from the tooth tip to the bottom of the gullet
10. **Tooth Face**..... The surface of the tooth on which the chip is formed
11. **Tooth Flank** ..... The angled back surface of the tooth opposite the tooth face
12. **Tooth Rake Angle** ..... The angle of the tooth face measured with respect to a line perpendicular to the cutting direction of the saw
13. **Tooth Tip**..... The cutting edge of the saw tooth

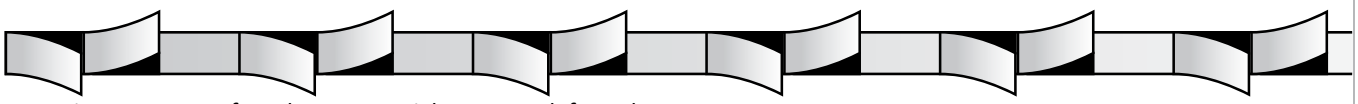
TOOTH SET SPECIFICATIONS





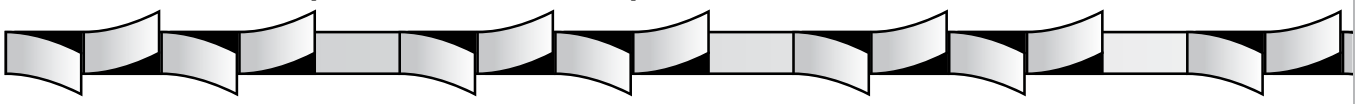
Here's where the blade makes the cut. The tooth design variables include shape, position, set, type and spacing. The combination of these variables will determine whether the blade can move easily through your material without binding or becoming clogged with chips.

Raker



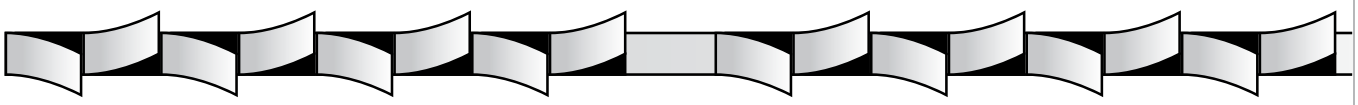
Recurring sequence of teeth - one set right, one set left, and one unset.

Modified Raker (double set raker)



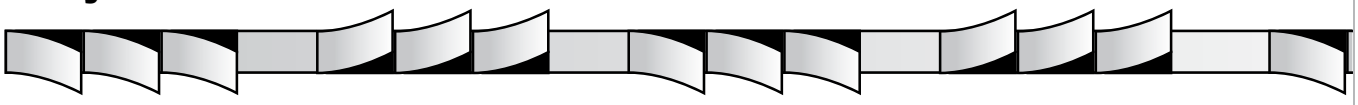
Recurring sequence set left, right, left, right, straight tooth pattern.

Variable Pitch Modified Raker



Set sequence depends on the number of teeth in the variable pitch tooth pattern.
Recurring sequence with more than two set teeth before an unset tooth.

Wavy



Groups of teeth, usually 3 or 4, set to each side in a controlled pattern with an unset tooth between groups.

Alternate (ETS)

Every tooth set alternately to the left and right.

BAND SAW TOOTH PITCHES

Variable Pitch - 0°

Feature
- ▼ Varying gullet depth
- ▼ 0˚ Rake angle
- ▼ Variable tooth spacing

Benefit
- ▼ Excellent chip carrying capacity
- ▼ Reduces harmonic vibration
- ▼ Cuts smoother and more efficiently

Value
- ▼ Improves blade life
- ▼ Reduces noise
- ▼ Eliminates secondary operations, improves productivity

Variable Pitch Positive Rake

Feature
- ▼ Varying gullet depth
- ▼ Variable tooth spacing
- ▼ Positive rake angle

Benefit
- ▼ Better chip formation
- ▼ Excellent chip carrying capacity
- ▼ Reduces harmonic vibration
- ▼ More aggressive cutting; better tooth penetration

Value
- ▼ Cuts smoother, faster
- ▼ Improves productivity
- ▼ Reduces noise levels
- ▼ Generates less heat, improves blade life

Standard Raker

Feature
- ▼ Equally spaced teeth
- ▼ 0˚ Rake angle

Benefit
- ▼ Excellent chip carrying capacity

Value
- ▼ Increased productivity, versatility

Skip

Feature
- ▼ Wide flat gullets
- ▼ 0˚ Rake angle
- ▼ Equally spaced teeth

Benefit
- ▼ Excellent chip carrying capacity
- ▼ Non-metallic, non-ferrous cutting applications (wood, plastic, brass, copper, bronze, and aluminum)

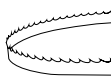
Value
- ▼ Breaks "stringy" chips; improves cutting capability
- ▼ Greater productivity for specific applications

Hook

Feature
- ▼ Wide rounded gullets
- ▼ Equally spaced teeth
- ▼ Positive rake angle

Benefit
- ▼ Excellent chip carrying capacity in non-metallic applications
- ▼ Positive rake provides better tip penetration with less feed pressure

Value
- ▼ Better cutting performance, productivity
- ▼ Good surface finish to eliminate secondary operations



BLADE RECOMMENDATION CHECKLIST

MORSE

Complete by:

Date:

After completing the checklist, please see product chart on back page or

Contact Morse Technical Assistance

Complete and Fax to: 1(330) 453-1111

or call 1(330) 453-8187 or visit www.bladewizard.com

User Information

Company:

Address:

Contact:

Phone No.:

Distributor Information

Company:

Address:

Contact:

Phone No.:

Fax No.:

e-mail:

Current Blade Information

Manufacturer:

Length: Width:

Thickness: Tooth Pitch:

Type: ❑ Carbon ❑ Matrix ❑ M42 ❑ Other

Monthly blade usage:

Current blade distributor:

Current blade cost: $ (ea.)

Machine Information

Make:

Model:

❑ Vertical ❑ Horizontal

Blade Speed (sfm):

Feed Rate:

Application Information

Solid Square _____ Solid Round _____ I-Beam _____ Angle Iron _____ Channel Iron _____ Round Tubing _____ Square Tubing _____

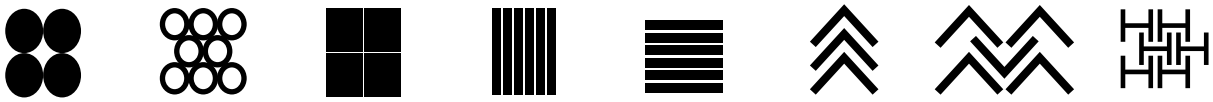
On the lines provided below each icon, **list material width** and **wall thickness** (if applicable) for each material type being cut

Types of Cutting

(Check all that apply)

❑ Single Piece Cut-off

❑ Bundled Cut-off 1. Number of pieces: _____ 2. Check each configuration that applies:



❑ ❑ ❑ ❑ ❑ ❑ ❑ ❑

Materials Being Cut

(Check all that apply)

Type	Grade
❑ Non-Ferrous	
❑ Mild Carbon Steels	
❑ Tool Steels	
❑ Stainless Steels	
❑ Super Alloys	
❑ Other	

Production Usage (per day)

❑ Light (2 hrs. or less)

❑ Medium (3-6 hrs.)

❑ Heavy (7 hrs. or more)

Problems with Present Blade

❑ Breaking blades ❑ Premature dulling

❑ Tooth strippage

❑ Cost

Blade Recommendation