



GRADE SAWING

Sawing logs into lumber is not an easy manufacturing process.

However, there are some basic steps that, if correctly followed, will make the process more efficient and profitable. The goal of grade sawing should be to maximize the economic value from a log, not necessarily the volume of lumber. Value can be lost at every step in the manufacturing process from bucking and log handling to trimming and piling lumber. Therefore, it is vital that every step be taken with purpose and precision.

Here are some procedures to consider when sawing a log into grade lumber.

SELECTING AN OPENING FACE

- Take note of any knots, seams or other defects as the log is rolled onto the carriage or mill bed.
- **Opening Face:** The first saw cut made on the log. This cut also sets the location of the other three faces on the log.
- **Minimum Opening Face Size:**
 - For clear faces, make sure the first board can make the minimum size of the highest possible grade. (e.g., FAS → 6" x 8' OR Select → 4" x 6')
 - If knots present, or face will not make clear lumber, consider taking a smaller face to increase overall fiber recovery (e.g., 1 Com. grade min. board size is 3" x 4').
- **Best versus worst opening face first:**
 - In most cases, sawyers should focus on capturing the highest value from the log and thus saw the best face first.
 - Securing large logs can be difficult, making it necessary to saw into a poor face first to get a flat surface. This helps stabilize the log when the best face is sawn.
 - Depending on mill equipment it can make sense to saw either the best or worst face first.

LOG POSITIONING

- When sawing for grade, position the log so knots are placed on the corners of the cant and, as a result, end up on the edges of the sawn boards.
 - If possible, put all visible defects on one face.
 - Position large defects in the middle of one face so not to negatively impact the grade on two adjacent faces.
- Place straight seams on the corner of a cant like a knot.
 - Contain spiral seams to as few faces as possible.



Position medium/small knots toward corners of the cant.

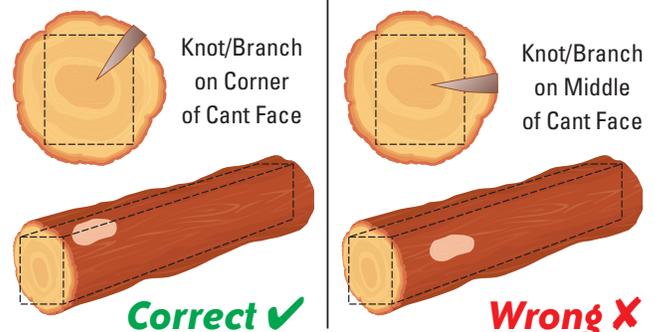


Contain large knots and spiral seams to one face.

OTHER HELPFUL TIPS

- If a log has multiple knots, it is easiest to focus on finding a clear face and putting the defect(s) most relevant to that clear face on the cant corners.
- Monitor saw feed rate when starting to cut into a log or through knots.
- Minimize extra carriage or saw head travel in between cuts.

POSITIONING DEFECTS



TAPER SAWING

- By taking a full taper cut you align the entire length of the log to run parallel to the saw, resulting in full length boards cut parallel to the bark.
- It may not be necessary to take a full taper cut along the entire log length to achieve the desired minimum opening face.
- Removing taper entails sawing so the log is parallel or square to the carriage knees or mill bed, but not the saw.
- Remove taper from poor quality material, either poor side of a log full of knots or low-grade defect center.

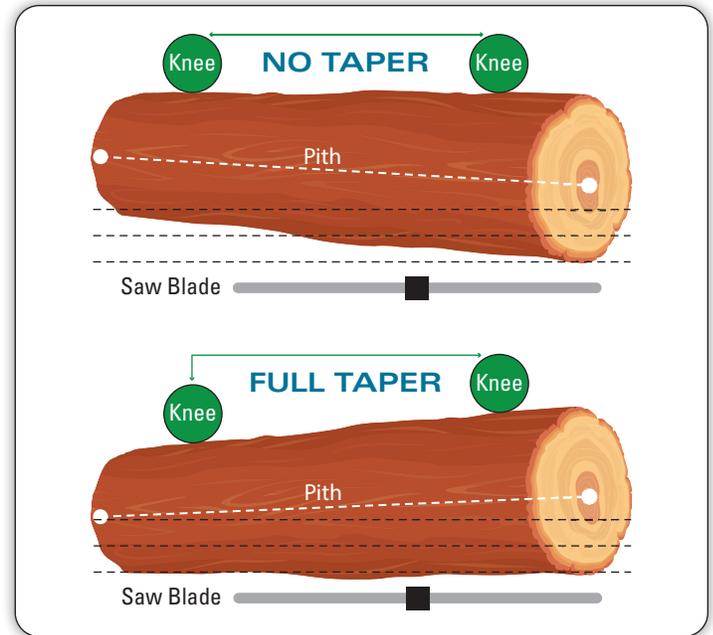
EXAMPLE SAWING PATTERNS

Certain sawing patterns are ideal for different log sizes and qualities. The following are common examples:

- **Small Diameter/Low Quality Logs:** Start sawing best face with enough taper so first board meets minimum opening face size.
- **Large Diameter/Medium Quality Logs:** Identify best face on log, roll that side against knees of the carriage:
 - Start sawing the face opposite the best face with no taper, only take enough boards to get a stable face to dog the log.
 - Flip log 180 degrees to saw the original best face.
- **High Quality Logs:** Taper saw all clear faces, remove taper from defect center:
 - Be mindful of customers specifications and concerns of making tapered lumber.
 - Given mill equipment, it may only be worthwhile to full taper saw one face on each axis of the cant.
- **Logs with Excess Sweep:**
 - Lightly saw horns off first to get a stable surface.
 - Flip the log 180 degrees and saw the belly of the log until a full length, flat surface is achieved.
 - Finish sawing the rest of the sides of the cant.
- **Oversized Logs:**
 - Identify correct position and minimum opening face.
 - Turn the log 1/8 of a rotation and saw down boards until it is of a manageable size.
 - Repeat 1/8 turn if needed, turning when grade of existing face is lower than potential of other face.

OTHER RESOURCES

- Cassens, Dan L. 2011. *Manufacturing and Marketing Eastern Hardwood Lumber Produced By Thin Kerf Band Mills*. Purdue Extension, Purdue University, West Lafayette, IN.
- Malcolm, F. B. 2000. *A Simplified Procedure for Developing Grade Lumber From Hardwood Logs*. USDA, Forest Service, Forest Products Lab, Madison, WI.



WHEN TO TURN THE LOG

- Turn the log when the grade of the next board on the face being sawn is less than the potential grade of boards from the adjoining faces.
- There are more defects closer to the pith or center of the tree.
- Rotating the log 90° is faster but creates more boards to be edged. 90° rotations can also leave unbalanced stress in lumber if a face is sawn too deep before turning.
- Rotating the log 180° is slower, but creates more wide boards and results in fewer boards to be edged.



Tight swirls and islands in wood grain indicate defect below. Left shows board surface closer to the outside of the tree, while the right is the reverse side of the board closer to the pith.

These are general recommendations for manufacturing hardwood lumber and should be used as a starting point for learning about the topic. The authors strongly encourage further study by analyzing your mill equipment and National Hardwood Lumber Association lumber grades.