

WOOD STRUCTURE AND PROPERTIES. . .

Mount Wachusett Community College in Gardner, Mass. and Wood Digest have teamed up to present a series of college-level wood technology courses. This is the eighth in the series.

By Ken Hanson,
Wood Technologist

THE FOREST AND WOOD PRODUCTS Institute at Mount Wachusett Community College (MWCC) in Gardner, Mass. has partnered with *Wood Digest* magazine to present a series of college-level wood technology courses. Readers may enroll at MWCC on a distance learning basis for college credit. The courses will be taught using a popular wood technology textbook, coupled with online lessons, discussions, and exams. The online component will use the MWCC Distance Learning System known as "Blackboard."

Over the next two years, Wood Digest magazine will publish monthly articles based on the course content from the MWCC Wood Products Technology cur-

Step 3. Print out the registration form and fill in all of the requested blanks.

Step 4. Mail, fax or scan/e-mail the registration form to the Forest and Wood Products Institute. The numbers, addresses and fees are preprinted on the form.

Step 5. Contact the instructor Ken Hanson at (978) 630-9179 or khanson@mwcc.mass.edu with any questions you may have.

Step 6. Upon registration confirmation, the Institute will e-mail you a welcoming packet of information. You must have Internet access to enroll in this class. Students may enroll in this course ANYTIME throughout the 12-month period, with completion in September '03. There is NO maximum number of students.

This series of *Wood Digest* articles will highlight specific topics, guiding both students and readers through the technological uses of wood, enabling them to become better in our chosen profession. Students who enroll in this Web course will also take quizzes, exams, form discussion and study groups as well as receive three undergraduate credits which may be used toward the completion of a degree at MWCC or selected college.

To all new students and readers: MWCC and *Wood Digest* are excited to offer these Wood Technology courses in this new, exclusive format. We are currently enrolling students into this course at the college and can easily catch you up to the rest of the class. Your questions and comments are beneficial to us all as we continue this Wood Structure and Properties wood technology course. If you have a comment pertaining to any of the articles, please forward to me at khanson@mwcc.mass.edu. I will utilize as many points of view as possible when describing the nature of wood.

ricula. The initial course is titled "Wood Structure and Properties." Material from this course will be featured through to September 2003. Immediately following, the second course, Wood Machining will continue on to September '04.

For college credit, application and registration information about this Distance Learning Course, please follow these step-by-step procedures:

Step 1. Open *Wood Digest* courses at <http://www.mwcc.mass.edu/HTML/FWP/default.html>.

Step 2. Open either the course registration form and/or syllabus for your review.

WOOD DRYING — PART 8 OF 12

DEFECTS IN WOOD — NATURAL AND MACHINE-MADE

A SHORT REVIEW AND A LOOK FORWARD...

This month marks a turning point in the course. For all of you who have enrolled or followed along with the *Wood Digest* magazine articles, these first eight months have concentrated on the structure of wood. The next four months will build upon that foundation of information and demonstrate the many ways our use of wood has benefited our lives.

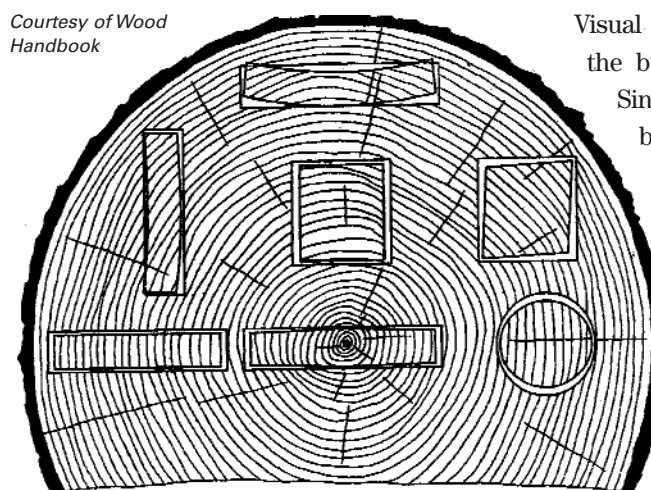
Woodworkers use their knowledge and skills to design and build their creations. The next few months will provide to you additional information about your choice of adhesives and engineered wood including wood I-beams. For those involved in house construction, wood I-beams may be a good alternative to traditional two-by materials, so we will study their pros and cons in June and July. Then in August, we will investigate both the beauty and functionality of wood, as it is used in furniture. If you would like to review any past articles, they are available at the website for *Wood Digest* magazine: www.woodworkingpro.com

A WOODWORKER'S PERSPECTIVE: IS THIS A DEFECT?

Wood is a natural material; therefore, no two pieces are exactly alike. For example, in the January article, we discussed wood being orthotropic, having different strength values for the longitudinal, radial and tangential planes (January issue, pg. 18-19). It is also understood that the strength values are averages of many tests and will vary based on the exact orientation of the growth rings and other natural occurrences (defects) in the wood.

A defect may be defined in many ways. It may be defined as a reduction in the wood's strength, value, purpose and grade. Defects can be placed into two categories, such as natural and man/machine-made. A defect is most rel-

Courtesy of Wood Handbook



TYPICAL WOOD SHRINKAGE PATTERNS FROM PARTICULAR LOCATIONS IN A LOG

evant if it is placed in a location where it may be seen or if it compromises strength requirements. As woodworkers, we are concerned about the strength characteristics of the product we are building. Most design work incorporates safety factors that take into account the potential for defects, damage, improper installation and extreme conditions.

A woodworker building a table will design for appearance by instinctively matching the grain pattern in the top to produce an appealing desired look. Variances in color, grain direction, knot location, glued edge quality, width of component, density and surface quality are evaluated. Next, the pieces are placed together to produce a lay-up, then glued and machined to produce the panel that will be made into an appealing table top.

The house builder will eye down the length of the floor joists and rafters and place all of the crowned edges in an

A defect may be defined as a reduction in the wood's strength value, purpose and grade.

upright position. Bowed or twisted two-by-fours will be cut into shorter lengths because their full-length condition will produce undesired results in a wall structure. Knot location, end checks or splits, forklift and chain saw damage, and milling machine damages are defects that the builder will evaluate before placing it in the building framework. It is necessary to evaluate every part in a constructed item because the customer is very selective and educated about quality!

Visual defects are evaluated by the builder and the purchaser.

Since we design a product to be visually appealing and properly designed, we must anticipate that the opinions of the purchaser(s) may differ from ours. After all, the customer is always right!

Let's look at individual defects and identify their possible cause(s). Defects in

wood caused by a machine, (i.e., snipe, tear-out, burn, etc.) are avoidable by paying more attention to the settings of the machine and providing better preventive maintenance measures. Proper machining techniques are necessary to reduce the amount of defective material and will increase the yield of your raw material.

For example, chip marks are caused by the inability of the air handling system to efficiently remove the chips from a planing operation. The possible causes may be a plug in the air handling system, inadequate hoods or excessive stock removal. In a particular example, after investigating the immediate area for proper hoods and stock removal amounts, the air handling system was found to have a plug in the pipe, restricting passage of chips. Further investigation found the root cause to be the suction from the fans to be lacking due to a loose pulley on the shaft.

NO. 1 CAUSE OF DEFECTS...

I am convinced that the process of removing moisture from wood is responsible for the largest percentage of man-made defects in wood, resulting in degrade, loss of revenue and production time. Every one of these defects can be controlled by understanding its possible reasons and investigating to identify its root cause. For example, freshly cut logs may split on their ends due to its rapid moisture loss. Corrective actions may include faster transportation to the sawmill, reducing airflow by the logs, or by spraying water or sealant on the ends.

The bark offers natural protection to drying; however, once the bark is removed and the log is sawn, the boards are now susceptible to drying defects on their entire surface. Surface and end checks will rapidly develop if the lumber is stored in an excessively sunny or windy location. During transportation, loads may need to be tarped to reduce rapid drying and the accumulation of

dirt and grit on the woods surface.

Inattention to the drying of wood may have immediate effects to the production line; however, many drying defects will be noticed when finish is applied. Honeycomb and surface checking are drying defects, and if not caught

Honeycomb and surface checking are drying defects, and if not caught early, they may only be seen when stain is applied.

early, they may only be seen when stain is applied. Not only may the parts be wasted, but all of the production time and the value additions may be wasted as well.

COMING NEXT MONTH

The information on wood structure and properties presented over the last eight months will assist us in relating to our everyday work experiences. In May, we will identify why adhesives are capable of joining wood and investigate the claim that a properly glued joint is actually stronger than the wood itself.

TRY IT YOURSELF!

To all readers and students: To explore the discussion topics above, you can follow along at home or at work. Due to the nature of information presented, it may be difficult to relate to the subject matter. Try surfing the net using the keywords from this article. Gather more information about the subject. If you find some good articles, please let the class know about them on Blackboards Discussion Board or e-mail to me.

The keywords are:

- 1.) Defect
- 2.) Lay-up
- 3.) Air handling system
- 4.) Chip marks
- 5.) Yield
- 6.) Honeycomb
- 7.) Surface check
- 8.) End coating (for lumber)

For enrolled students: As part of your homework, March's homework and quiz questions are now due. An April '03 homework assignment and quiz are available for you on Blackboard. If you have any questions about Blackboard or the homework, contact me or review the help section available on the MWCC website. **WD**

All articles edited by David Damery, Building Materials and Wood Technology Department-UMASS-Amherst, Mass.

Wood: Influence of Moisture on Physical Properties by John F. Siau

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