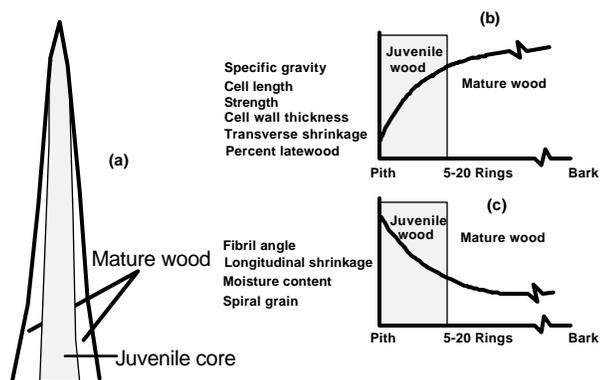


TECHLINE

Properties and Use of Wood, Composites, and Fiber Products

Properties of Juvenile Wood

In its first years of growth, a tree produces juvenile wood, a zone of wood extending outward from the pith. During this early growth period, the characteristics of the wood produced from year to year in each successive growth ring change markedly. During a "transition" period from 5 to 20 years of age, characteristics of the wood produced gradually improve until they become relatively constant. This material is known as mature wood.



Effect of juvenile wood on physical and mechanical properties: (a) juvenile core located in interior of tree bole; (b) properties that increase from juvenile to mature wood; and (c) properties that decrease from juvenile to mature wood.

In conifers, juvenile wood, compared with mature wood, has

- lower strength,
- lower specific gravity,
- thinner cell walls,
- lower cellulose content,
- lower percentage of latewood,
- higher longitudinal shrinkage,
- more compression wood,
- greater fibril angle, and
- higher lignin content.

All trees have juvenile wood, but it had little significance when the timber supply was primarily old-growth trees grown in natural forest conditions. In these trees, the juvenile wood core was small because early growth was suppressed by competition from surrounding trees. Additionally, the percentage of juvenile wood in the total volume was small because larger trees were harvested. Now, improved trees grown on intensively managed plantations reach sawtimber size and are harvested at a younger age. Because diameter growth is generally greatest during the years juvenile wood is produced, the juvenile wood core may be a very significant part of the harvest.

The paper industry has adapted to the increasing proportion of juvenile wood in their raw material by blending it with mature wood from other trees or species and by improved pulping technology. Some properties of paper are actually improved with juvenile wood.

The effect of juvenile wood on the ultimate strength of dimension lumber continues to be of concern. Recent research shows that dimension lumber cut from the juvenile wood core may have only 50 to 70 percent of the strength and stiffness of lumber cut from mature wood, depending upon the grade and species. These results are helping lumber standards groups assess the need to modify design stresses to account for the changing timber resource.

Work with laminated veneer lumber (LVL) has demonstrated the effect various amounts of juvenile wood can have on the structural integrity of an LVL product. The ratio of juvenile to mature wood strength of the same grade was 0.8. Small portions of juvenile wood strategically placed, however, have little effect on properties. The greatest effect of juvenile wood on LVL is on the cost of manufacturing.

For more information, contact:

David E. Kretschmann, Research Engineer

Forest Products Laboratory

One Gifford Pinchot Drive

Madison, WI 53705-2398

Phone: (608) 231-9307; FAX: (608) 231-9303

References

Kretschmann, David E., Moody, Russell C.; Pellerin, Roy F.; Bendtsen, B. Alan; Cahill, James M.; McAlister, Robert H.; Sharp, Donald W. 1993. Effect of various proportions of juvenile wood on laminated veneer lumber. Res. Pap. FPL-RP-521. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory. 31p.

Kretschmann, David E. and Bendtsen B. Alan. Ultimate tensile stress and modulus of elasticity of fast-grown plantation loblolly pine lumber. Wood Fiber Sci. 24(2): 189-203.



United States
Department of
Agriculture

Forest
Service

Forest Products
Laboratory

Phone: (608) 231-9200; FAX: (608) 231-9592
E-mail: mailroom/fpl@fs.fed.us
Web site: <http://www.fpl.fs.fed.us/>