

TECHNICAL NOTE NUMBER 240

UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

FOREST PRODUCTS LABORATORY

MADISON 5, WISCONSIN

REVISED December 1952

A HUNDRED DEFINITIONS PERTAINING TO WOOD AND OTHER FOREST PRODUCTS

Angiosperms: The botanical name for a group of plants that includes the so-called hardwoods; literally the word means "having the seeds enclosed." Terms commonly applied to trees belonging to the angiosperm group: hardwoods, deciduous trees, porous woods, broad-leaved trees.

Annual Ring: The growth layer put on in a single growth year.

Bird Peck: A small hole or patch of distorted grain resulting from birds pecking through the growing cells in the tree. In shape bird peck usually resembles a carpet tack with the point toward the bark, and it is usually accompanied by discoloration extending for a considerable distance along the grain and to a much lesser extent across the grain. The discoloration produced by the bird peck causes what is commonly known as mineral streak.

Blue Stain: A bluish or grayish discoloration of the sapwood caused by the growth of certain dark-colored fungi on the surface and in the interior of the wood; made possible by the same conditions that favor the growth of other fungi.

Boxed Heart: The term used when the pith falls entirely within the four faces anywhere in the length of a piece.

Brashness: A condition of wood characterized by an abrupt failure across the grain without splintering; frequently accompanied by small loads and deformations.

Broad-leaved Trees: See "Angiosperms."

Cambium: The layer of tissue just beneath the bark of the tree from which the new wood and bark cells of each year's growth develop. On the inner side of the cambium the typical wood cells, springwood and summerwood, are formed. On the outer side of the cambium the phloem, or bast, is formed.

Casehardening: A state of compression in the outer layers of a board or timber accompanied by tension in the center or core, the result of too severe drying conditions.

Cell: A general term for the minute units of wood structure, including wood fibers, vessel segments, and other elements of diverse structure and function.

Cellulose: The carbohydrate $(C_6H_{10}O_5)_x$ that is the principal constituent of wood and of parts of many plants.

Chemical Brown Stain: A discoloration of wood, which sometimes occurs during the air drying or the kiln drying of several species, apparently caused by the concentration and modification of extractives.

Collapse: The flattening of single cells or rows of cells in heartwood during the drying or pressure treatment of wood; characterized by a caved-in or corrugated appearance.

Compreg: Wood treated (preferably in the form of thin sheets or veneers) with water or alcohol solutions of synthetic resins that are subsequently polymerized by heat simultaneously with the application of pressure. Compreg has great stability with respect to moisture and shrinking and swelling, greater hardness than "Impreg," greater density than "Impreg" or normal wood (depending on the method of processing), and a glossy through-and-through finish that can be redressed by buffing alone when scratched. See "Impreg."

Compression Set: A condition in which some of the outer fibers in a piece of wood are permanently compressed as a result of the piece being restrained from swelling while taking on moisture.

Compression Wood: Abnormal wood that often forms on the lower side of branches and leaning trunks of softwood trees. Compression wood is identified by its relatively wide annual rings, usually eccentric, and its relatively large amount of summerwood, usually 50 percent or more of the width of the annual rings in which it occurs. Compression wood shrinks excessively and irregularly lengthwise, as compared with normal wood.

Conifer: A tree bearing seed cones; usually, an evergreen. A softwood.

Crook: That distortion of a board in which the edge is concave or convex longitudinally.

Crossband: To place the grain of layers of wood at right angles in order to minimize shrinking and swelling and consequent warping. Also the layer of veneer at right angles to the face plies, applied particularly to five-ply plywood and lumber-core panels.

Cross Grain: Cross-grained wood is that in which the fibers are not parallel to the axis of a piece.

Cut Stock: Softwood cuttings similar to hardwood dimension stock as described under "Dimension Stock," but used where softwoods are appropriate.

Decay: The disintegration of wood substance through the action of wood-destroying fungi.

Diffuse-porous Woods: Certain hardwoods in which the pores tend to be uniform in size and distribution throughout each annual ring or to decrease in size slightly and gradually toward the outer border of the ring. Compare "Ring-porous Woods."

Dimension Stock: Hardwood squares or flat stock, usually in pieces under the minimum sizes admitted in standard grades, rough or dressed, green or dry, cut to the approximate dimensions required for the products of woodworking factories. Dimension stock should be distinguished from "ready-cut stock," which is defined as material green or dry, sawed, turned, shaped, or otherwise machined to exact conditions and dimensions required for assembly into the various products of wood-using factories.

Dote: "Dote," "Doze," and "rot" are synonymous with "decay" and may be any form of decay that may be evident as either a discoloration or a softening of the wood.

Dry Rot: A term loosely applied to any dry crumbly decay but especially to that which, when in an advanced stage, permits the wood to be easily crushed to a dry powder. The term is actually a misnomer for any decay, inasmuch as all fungi require considerable moisture for growth.

Durability: A general term for permanence or lastingness. Frequently used to refer to the degree of resistance of a species of wood to attack by wood-destroying fungi under conditions that favor such attack. In this connection decay resistance is a more specific term.

Edge-grain: Vertical-grain (edge-grain, rift-grain, comb-grain, or quarter-sawed) lumber is that which has been sawed so that the wide surfaces extend approximately at right angles to the annual growth rings. Material is considered vertical grain when the rings (so-called grain) form an angle of 45° to 90° with the wide surface of the piece. Compare "Flat-grain."

Empty-cell Process: Any process for impregnating wood with preservatives or chemicals in which air is imprisoned in the wood under pressure of the entering preservative and then expands when pressure is released to drive out part of the injected preservative or chemical. The air pressure in the wood may be built up by applying compressed air before admitting preservative, or dependence may be placed upon the air naturally in the wood. The distinguishing characteristic of the empty-cell process is that no vacuum is drawn before applying the preservative. The aim is to coat the cell walls with preservative and leave the cell cavities empty or only partially filled. Compare "Full-cell Process."

Equilibrium Moisture Content: The moisture content at which wood neither gains nor loses water when surrounded by air at a given relative humidity and temperature.

Extractives: Substances in wood, not an integral part of the cellular structure, that can be dissolved out with hot or cold water, ether, benzene, or other relatively inert solvents.

Fiber-saturation Point: The stage in the drying or wetting of wood at which the cell walls are saturated and the cell cavities are free of water. Usually taken as approximately 30 percent moisture content, based on oven-dry weight.

Fireproofing: Making wood resistant to fire. Wood cannot be treated chemically so that it will not char or decompose at temperatures of about 280° F. and higher. What effective fireproofing does is to make wood difficult to ignite, keep it from supporting its own combustion, and delay the spreading of flame over the wood surface.

Flat-grain: Flat-grain lumber is that which has been sawed in a plane approximately perpendicular to a radius of the log. Synonymous terms: slash-grain, "bastard" grain, plain-sawed, tangential-cut. Lumber is considered flat-grain when the wide surface makes an angle of less than 45° with the annual growth rings. Compare "Edge-grain."

Flitch: A thick piece of lumber with wane (bark) on one or more edges.

Full-cell Process: Any process for impregnating wood with preservatives or chemicals in which a vacuum is drawn to remove air from the wood before admitting the preservative. This favors heavy absorption and retention of preservative in the treated portions. Compare "Empty-cell Process."

Gelatinous Fibers: Abnormal fibers in certain hardwoods. They are associated with "Tension Wood," which see.

Groundwood: Pulp produced by mechanical disintegration of wood on grinding stones. It is the main constituent of newsprint paper and the "groundwood-book" type of magazine paper. It is also used in paper towels, tissues, and paper boards. The pulp yield by the groundwood process is in excess of 90 percent of the wood.

Gymnosperms: The botanical name for the group of plants that includes the so-called softwoods; literally the word means "seeds not enclosed." Terms commonly applied to trees belonging to the gymnosperm group: softwoods, evergreens, nonporous woods, needle- or scale-leaved trees, conifers. Most, but not all, true gymnosperms are needle-leaved, evergreen, and cone-bearing. Compare "Angiosperms."

Hardwoods: Broad-leaved trees. The term refers to a botanical grouping and not to the actual hardness of the wood. Some of the so-called hardwoods are in reality very soft. All hardwoods contain pores or vessels, specialized water-conducting elements not characteristic of softwoods. Angiosperms is the botanical name for hardwoods.

Heartwood: The wood, extending from the pith to the sapwood, the cells of which no longer participate in the life processes of the tree. Heartwood may be infiltrated with gums, resins, and other materials that usually make it darker and more decay resistant than sapwood. Compare "Sapwood."

Hemicellulose: A polysaccharide or a mixture of polysaccharides that is associated with cellulose soluble in alkali, and that is easily hydrolyzed by dilute acids.

Honeycombing: Checks that occur in the interior of a piece of lumber, often not visible at the surface. Honeycombing usually occurs along the rays.

Impreg: Wood treated (generally in the form of thin sheets or veneers) with water or alcohol solutions of synthetic resins and heat treated to polymerize the resins. The resins are bonded (chemically rather than physically) to the wood fibers, so that moisture absorption and shrinking and swelling are greatly reduced. Hardness is increased.

Interlocking Grain: Wood in which the fibers are inclined in one direction in a number of rings of annual growth, then gradually reverse and incline in an opposite direction in succeeding growth rings, then reverse again, etc.

Laminated Wood: A piece of wood built up of plies or laminations that have been joined with glue and in which the grain of all plies is essentially parallel.

Lignin: The second most abundant constituent of wood, located principally in the middle lamella, which see. Lignin constitutes 16 to 35 percent, by weight, of wood. Its chemical structure has not been definitely determined. Lignin may be isolated by treating wood with 72 percent sulfuric acid followed by dilution with water and hydrolysis to remove the cellulose associated with the lignin.

Middle Lamella: A thin cementing layer between plant cells composed, in wood, principally of lignin. This layer is dissolved out in chemical pulping.

Moisture Gradient: A condition of graduated moisture content between the successive zones of a material, such as wood, which may be losing or absorbing moisture. During seasoning the gradations are between the moisture content of the relatively dry surface zones and the wet zones at the center of the piece.

Moistureproofing: Making wood resistant to moisture changes. Referring to wood, moistureproofing is a relative rather than an absolute term. No practicable coating or treatment for wood is known that will completely prevent moisture changes.

Naval Stores: A term applied to chemically reactive oils, resins, tars, and pitches derived from oleoresin contained in, exuded by, or extracted from trees chiefly of the pine species (genus Pinus), or from the wood of such trees.

Oleoresin: The viscous mixture of nonvolatile solids and essential oil secreted by the resin-forming cells of the pines and certain other trees.

Oleoresin from long-leaf and slash pine is of great commercial importance, being the raw material of the United States' turpentine and rosin production. It is obtained by regularly repeated wounding of the living tree.

Pallet: A transportable platform of wood, fiberboard, or other materials on which goods may be loaded (secured to the pallet or loose) for handling, shipment, or storage.

Peck: Pockets or areas of disintegrated wood caused by advanced stages of localized decay in the living tree. It is usually associated with cypress and incense cedar. Compare "Bird Peck."

Pit: A relatively unthickened portion of a cell wall where a thin membrane may permit liquids to pass from one cell to another.

Plain-sawed: See "Flat Grain."

Plywood: A cross-banded assembly made of layers of veneer or veneer in combination with a lumber core or plies joined with an adhesive. Two types of plywood are recognized, namely, (1) veneer plywood and (2) lumber-core plywood. The grain of adjoining plies is usually laid at right angles, and almost always an odd number of plies are used to obtain balanced construction.

Porous Woods: Another name for the hardwoods, which frequently have vessels or pores large enough to be readily seen without magnification.

Quarter-sawed: See "Edge Grain."

Radial Section: A lengthwise section in a plane that passes through the center line of the tree trunk.

Rays: Strips of cells extending radially within a tree and varying in height from a few cells in some species to 4 inches or more in the oaks, in which species they produce the characteristic "silver grain" seen on radial (quarter-sawed) surfaces. The rays serve primarily to store food and transport it horizontally in the tree.

Ring-porous Woods: A group of hardwoods in which the pores are comparatively large at the beginning of each annual ring and decrease in size more or less abruptly toward the outer portion of the ring, thus forming a distinct inner zone of pores known as the springwood and the outer zone with smaller pores known as the summerwood.

Rotary-cut Veneer: Veneer cut in a continuous strip by rotating a log against the edge of a knife in a special type of lathe. Compare "Sliced Veneer" and "Veneer."

Sap: The term commonly used to refer to all of the fluids in a tree, special secretions and excretions, such as oleoresin, excepted.

Sapwood: The (usually) light-colored zone of wood next to the bark, 1/2 to 3 or more inches wide, that is actively involved in the life processes of the tree (water and sap movement, food storage). Under conditions favorable to decay sapwood is more susceptible to decay than heartwood; as a rule it is more permeable to liquids than heartwood. Sapwood is not essentially weaker or stronger than heartwood of the same species.

Second-growth: Denotes timber that has grown after the removal of all or a large portion of the previous stand whether by cutting, fire, wind, or other agency.

Semichemical Process: Any pulping process combining mild cooking and mechanical defiberizing of softened chips. Semichemical processes are named according to the kinds of cooking chemicals used, that is, the neutral sulfite semichemical process employs a mixture of sodium sulfite and sodium bicarbonate, and the sulfate semichemical process employs sodium hydroxide and sodium sulfide as in the "Sulfate Process." Semichemical processes are particularly suited for obtaining high yields (55 to 90 percent) of pulps from little-used hardwoods. Unbleached neutral sulfite semichemical and sulfate semichemical pulps are used mostly for boards, like in shipping containers. Bleached neutral sulfite semichemical pulp can be used in book, glassine, and specialty papers and in carton and other high-quality board stocks. The cold-soda semichemical process employs caustic soda at atmospheric temperature and pressure.

Set: Restraint or fixation of wood fibers that are kept from shrinking or swelling, with loss or gain of moisture, by adjoining fibers that are at a different moisture content.

Sliced Veneer: Veneer that is sliced off a log or bolt by moving the log or flitch in one plane against a large knife or by moving a large knife across a bolt or flitch. Compare "Rotary-cut Veneer" and "Veneer."

Soda Process: An alkaline pulping process involving the use of an aqueous solution of sodium hydroxide, used in the production of book, maga-

zine, and lithograph pulps, principally from hardwoods. The paper produced by the soda process is normally soft, bulky, opaque, and easily bleached and loaded. The yield is in the neighborhood of 40 percent based on the oven-dry weight of chips admitted to the digester.

Softwoods: See "Gymnosperms."

Specific Gravity: The ratio of the weight of a body to the weight of an equal volume of water at some standard temperature.

Spiral Grain: A type of growth in which the fibers take a spiral course about the bole of the tree instead of the normal vertical course. The spiral may extend right handed or left handed around the tree trunk.

Springwood: The portion of the annual growth ring that is formed during the early part of the season's growth. It is usually less dense and weaker mechanically than summerwood.

Starved Joint: A glued joint in which, as a result of the use of excessive pressure or insufficient viscosity of the glue, or a combination of these causes, the glue is forced out from between the surfaces to be joined, leaving insufficient glue to make a strong joint.

Strength: The term in its broader sense embraces collectively all the properties of wood that enable it to resist different forces or loads. In its more restricted sense, strength may apply to any one of the mechanical properties, in which event the name of the property under consideration should be stated; thus strength in compression parallel to grain, strength in bending, hardness, etc.

Sulfate Process: An alkaline pulping process, involving the use of caustic soda and sodium sulfide (the latter derived from salt cake or sodium sulfate by a smelting process), used in the production of wrapping papers and container boards from both hardwoods and softwoods (mostly softwoods). The pulp produced by the sulfate process is tough, and for this reason it is used for sacks and wrapping papers and the liners of shipping containers. Bleached sulfate pulp is used in bond, writing, wrapping, and other strong white papers. The yield is about 50 percent on the basis of the oven-dry weight of chips admitted to the digester.

Sulfite Process: An acid pulping process, involving the use of an aqueous solution of sulfur dioxide and calcium or magnesium bisulfite or a mixture of the two, used in the production of newsprint and writing papers from long-fibered softwoods with low resin content, such as the spruces,

firs, and hemlocks, and such hardwoods as the birches, gums, and maples. The pulp produced is long-fibered and light-colored. The yield is about 45 percent on the basis of the oven-dry weight of chips admitted to the digester. Sulfite pulp is used unbleached in newsprint paper and numerous other kinds of light-colored papers and boards, and bleached in fine white bond, writing, book, and special papers. Highly purified sulfite pulp is used for making rayon and other cellulose chemical products.

Summerwood: The outer, later-formed, usually denser portion of the annual growth ring.

Tangential Section: A longitudinal section through a tree or limb perpendicular to a radius. Flat-sawed lumber is cut tangentially.

Tension Set: A condition of wood in which a group of fibers, owing to restraint imposed by adjoining fibers or by an external mechanical agency, are fixed or set in a condition of tension as a result of a restraint on normal shrinkage during a drop in moisture content.

Tension Wood: An abnormal form of wood found in leaning trees of some hardwood species and characterized by the presence of gelatinous fibers and excessive longitudinal shrinkage.

Transverse Section: A section through a tree or timber at right angles to the pith.

Tyloses: Masses of parenchyma cells appearing somewhat like froth in the pores of some hardwoods, notably the white oak and black locust. Tyloses are formed by the extension of the cell wall of the living cells surrounding vessels of hardwoods or sometimes in a similar manner by the extension of the cell wall into resin-passage cavities in the case of softwoods.

Veneer: Thin sheets of wood produced by rotary cutting, sawing or slicing. Veneer thicknesses to some extent overlap the thicknesses of re-sawn lumber.

Warp: Any variation from the true or plane surface. Warp includes crook, bow, cup, and twist, or any combination of these defects.

Weathering: The mechanical or chemical disintegration and discoloration of the surface of wood that is caused by exposure to light and to the alternate shrinking and swelling of the surface fibers with continual changes in moisture content due to weather changes.

Whitewater: Water, carrying fiber, clay, and chemical, recovered or wasted from the wire and suction box of a paper machine. The water is white or milky in appearance.

Wood Flour: Wood ground finely enough to pass a 40- to 140-mesh screen, produced by stone mills of the "top runner" type, steel burr roller mills, or any one of the several types of hammer and beater mills; used chiefly in linoleum, dynamite, and synthetic resin products.

Wood Preservative: Any substance that, for a reasonable length of time, is effective in preventing the development and action of wood-rotting fungi, harmful insects, and marine borers that deteriorate wood.

Wood Substance: The solid material of which wood is composed. It usually refers to the extractive-free solid substance of which the cell walls are composed, but this is not always true. The term is usually used in conjunction with specific gravity to designate the value for material free from air-containing capillaries and moisture.