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Standard Terminology Relating to Wood and Wood-Based Products¹

This standard is issued under the fixed designation D9; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

The definitions contained herein constitute a lexicon of terms of general interest. Definitions in more specialized wood product or process use will be found in other standards. These include Practice D245, Terminology D907, Terminology D1038, Nomenclature D1165, Terminology D1554, Terminology F547, Practice D2555, and Terminology C274.

1. Scope

1.1 This terminology covers a repository of definitions essential for the business of Committee D07.

1.2 The following criteria shall be followed by Subcommittee D07.91 in selecting terms and associated definitions for inclusion in this terminology.

1.2.1 Terms and associated definitions shall be selected if they are in general use in the conduct of the standards over which D07 has jurisdiction.

1.2.2 Terms and associated definitions in general industrial or technical use that are not unique to wood or wood-based products are not included.

1.2.3 Terms and associated definitions that are unique to a single D07 standard and defined therein or generally understood or adequately defined in other readily available sources may not be included in this terminology.

1.3 When a term is used in an ASTM document for which Committee D07 is responsible, it is included in this terminology only when judged an essential term by Subcommittee D07.91.

1.4 A definition is a single sentence with additional information included in discussion notes.

1.5 Terms and definitions shall be reviewed every 5 years; the year of last review is appended.

2. Referenced Documents

2.1 *ASTM Standards*:²

C274 [Terminology of Structural Sandwich Constructions](#)

D143 [Test Methods for Small Clear Specimens of Timber](#)

D245 [Practice for Establishing Structural Grades and Related Allowable Properties for Visually Graded Lumber](#)

D907 [Terminology of Adhesives](#)

D1038 [Terminology Relating to Veneer and Plywood](#)

D1165 [Nomenclature of Commercial Hardwoods and Softwoods](#)

D1554 [Terminology Relating to Wood-Base Fiber and Particle Panel Materials](#)

D2016 [Test for Moisture Content of Wood](#)³

D2555 [Practice for Establishing Clear Wood Strength Values](#)

F547 [Terminology of Nails for Use with Wood and Wood-Base Materials](#)

3. Terminology

allowable properties—mechanical properties of materials as prepared for design use. Allowable properties of wood are identified with stress-grade descriptions and reflect the orthotropic structure of wood. Often considered synonymous with allowable unit stresses, working stresses, and design stresses.

¹ This terminology is under the jurisdiction of ASTM Committee D07 on Wood and is the direct responsibility of Subcommittee D07.91 on Terminology and Editorial. Current edition approved May 1–Nov. 15, 2009. Published June 2009/January 2010. Originally approved in 1907. Last previous edition approved in 2005/2009 as ~~D9-05:D9 – 09~~. DOI: 10.1520/D0009-09A.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Withdrawn. The last approved version of this historical standard is referenced on www.astm.org.

American Softwood Lumber Standard—a voluntary product standard of the U.S. Department of Commerce which serves as a basis for the preparation and revision of industry-sponsored grading rules for lumber.

American standard lumber—lumber conforming to the basic provisions of the American Softwood Lumber Standard.

annual ring—the growth layer produced by the tree in a single growth year, including earlywood and latewood.

bark pocket—the layer of a tree outside the cambium comprising the inner bark and the outer bark.

bark product—an opening between annual growth rings that contains bark. Bark pockets appear as dark streaks on radial surfaces and as rounded areas on tangential surfaces.

inner bark—the layer of living bark (phloem) that separates the outer bark from the cambium and which in the living tree generally is moist and soft.

outer bark—the layer of dead bark outside the inner bark, forming the exterior surface of the tree stem. The outer bark frequently is corky and dry.

basic stress (*archaic*)—the term once used for an allowable property for clear, straight-grained lumber.

batten—a narrow strip of lumber for covering the adjoining edges of roofing or siding, often designated as “batts.”

board foot—a unit of measurement represented by a board 1 ft long, 1 ft wide, and 1 in. thick (abbreviation: ft. b.m., bd. ft., fmb).

In finished or surfaced lumber, the board-foot measure is based on the nominal size. In practice, the working unit is 1000 board feet (abbreviation: M bd. ft., M B.M., M B.F).

board measure—a unit of measurement of the volume in board feet of logs or lumber (abbreviation: B.M.).

boards—see **lumber**.

bole—the stem or trunk of a tree of size sufficient to yield lumber, veneer, or poles.

bolt—(1) a short section of a tree trunk or limb;

(2) a short log of a length suitable for peeling in a lathe for veneer; and

(3) a short portion of a log prepared for production of shingles, staves, etc.

bow—the distortion of a piece of lumber in which there is a deviation in a direction perpendicular to the flat face from a straight line from end to end of the piece.

brashness—a condition that causes some pieces of wood to be relatively low in shock resistance for the species and, when broken in bending, to fail abruptly without splintering at comparatively small deflections.

built-up timbers—an assembly made by joining layers of lumber together with mechanical fastenings so the grain of all laminations is essentially parallel.

burl—(1) a hard, woody outgrowth on a tree, more or less rounded in form, usually resulting from the entwined growth of a cluster of adventitious buds; and

(2) in wood or veneer, a localized severe distortion of the grain generally rounded in outline, usually resulting from overgrowth of dead branch stubs, varying from ½ in. to several inches in diameter; frequently includes one or more clusters of several small contiguous conical protuberances, each usually having a core of pith but no appreciable amount of end grain (in tangential view) surrounding it.

cambium—the layer of cells that lies between the inner bark and the wood of a tree, that repeatedly subdivides to form new wood and bark cells.

cant—a log that has been slabbed on one or more sides, usually with the intention of resawing at right angles to the widest sawn face.

casehardening—a condition of stress and set in wood due to drying in which outer fibers are under compressive stress and inner fibers under tensile stress, a condition that often exists during subsequent processing. In commerce, the term often connotes a degree of severity regarded as detrimental in use.

cell—a general term for the minute units of wood structure having distinct cell walls and cell cavities including wood fibers, vessel segments, and other elements of diverse structure and function.

cellulose—the carbohydrate that is the principal constituent of wood and forms the structural framework of the wood cells.

characteristic—a distinguishing feature or trait. In grading lumber and other wood products, a feature in or on the wood which by its nature, extent, and frequency of occurrence determines the grade or level of quality.

characteristic size—the standard dimensions of the piece at which the characteristic value is calculated.

characteristic value—the structural property estimate, typically a population mean, median, or tolerance limit value estimated from the test data that is representative of the population being sampled. Test data is typically adjusted to standardized conditions of temperature, moisture content, and characteristic size.

check—a separation of the wood along the fiber direction that usually extends across the rings of annual growth, commonly resulting from stresses set up in wood during seasoning.

end check—a seasoning check occurring on the end of a board or other piece of wood.

heart check—a check that extends across the growth layers in one or more directions from the pith toward, but not to, the surface of a piece of wood; a synonym is *pith check*.

pith check—see *heart check*.

roller check—a crack in the wood structure caused by a piece of cupped lumber being flattened between machine rollers.

star check—a heart check in which the separation extends in more than one direction from the pith.

surface check—a check occurring on the surface of a piece of wood, usually on the tangential face not extending through the piece.

through check—a check that extends through a piece of wood, or from a surface to the opposite or to an adjoining surface.

chips—small fragments of wood chopped or broken by cuts such as by a planer, chipper, mechanical hog, hammermill.

clear—free of defects or imperfections.

coarse grain—see **grain**.

collapse—the flattening of single cells or rows of cells during the drying or pressure treatment of wood, characterized by a caved-in or corrugated appearance.

composite wood beam—a laminar construction comprising a combination of wood and other simple or complex materials assembled and intimately fixed in relation to each other so as to use the properties of each to attain specific structural advantage of the whole assembly.

compression failure—deformation of the wood fibers resulting from excessive compression along the grain either in direct end compression or in bending. It may develop in standing trees due to bending by wind or snow or to internal longitudinal stresses developed in growth, or it may result from stresses imposed after the tree is cut. In surfaced lumber, compression failures appear as fine wrinkles across the face of the piece.

compression parallel to grain—compression, endwise (parallel to the grain). The imposition of a compressive stress that acts in a direction parallel to the grain of the wood, as in a column.

compression perpendicular to grain—compression, sidewise (perpendicular to the grain). The imposition of a compressive stress that acts in a direction approximately perpendicular to the grain of the wood.

compression wood—abnormal wood formed typically on the lower side of branches and inclined trunks of softwood trees. Compression wood is identified by its relatively wide annual rings, usually eccentric, relatively large amount of latewood, sometimes more than 50 % of the width of the annual rings in which it occurs, and its lack of demarcation between earlywood and latewood in the same annual rings. Compression wood shrinks excessively lengthwise, as compared with normal wood.

conifer—a tree belonging to the order *Coniferae*, usually evergreen, with cones and needle-shaped or scalelike leaves, and producing wood known commercially as “softwood.”

crook—a distortion of a piece of lumber in which there is a deviation in a direction perpendicular to the edge from a straight line from end to end of the piece.

cross break—a separation of the wood cells across the grain. Such breaks may be due to internal stress resulting from unequal longitudinal shrinkage or external forces.

cross grain—see **grain**.

cross section—a section of a stem, board, or other piece of wood taken at right angles to its longitudinal axis.

crosscut—to cut a board, timber, or log generally transverse to the direction of the fibers; a synonym is “buck”.

cup—a distortion of a board in which there is a deviation flatwise from a straight line across the width of the board.

decay—decomposition of wood substance caused by action of wood-destroying fungi, resulting in softening, loss of strength and weight, and often in change of texture and color.

advanced (or typical) decay—the older stage of decay in which the destruction is readily recognized because the wood has become punky, soft and spongy, stringy, ring-shaked, pitted, or crumbly. Decided discoloration or bleaching of the rotted wood is often apparent.

incipient decay—the early stage of decay that has not proceeded far enough to soften or otherwise perceptibly impair the hardness of the wood. It may be accompanied by a slight discoloration or bleaching of the wood.

pocket rot—advanced decay that appears in the form of a hole, pocket, or area of soft rot usually surrounded by apparently sound wood.

defect—any irregularity or imperfection in a tree, log, piece, product, or lumber that reduces the volume of sound wood or lowers its durability, strength, or utility value.

degrade, n—a reduction in quality of lumber, logs, or other wood products due to processing.

dense—(1) term used in stress grading of certain softwood species to signify a high specific gravity; and

(2) a visual estimate of high specific gravity. To be classified as dense, the softwood species shall average on one end or the other of each piece, not less than six annual rings per inch and one-third or more latewood. Pieces not less than four rings per inch shall be accepted as dense if they average one-half or more latewood.

depth factor—the factor included in deriving the allowable bending stress for rectangular members which takes into account the somewhat lower unit strength developed in larger members as compared to smaller members; archaic terminology more correctly termed **size factor**.

depth of beam—that dimension of the beam that is perpendicular to the span and parallel to the direction in which the load is applied.

diffuse porous wood—certain hardwoods in which the pores exhibit little or no variation in size or distribution throughout the growth ring, only decreasing slightly in size, gradually toward the outer border of the ring.

dimensional stabilization—treatment of wood to reduce swelling and shrinking caused by changes in its moisture content.

dote—see **decay**.

dressed size—see **lumber**.

drying—see **seasoning**.

dry-bulb temperature—temperature of the air as indicated by an accurate thermometer, corrected for radiation if significant.

durability—a general term for permanence or resistance to deterioration. 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, the term “decay resistance” is more specific.

duration of load—the duration of stress or the time during which a load acts on a member. In wood, a design consideration for modifying allowable stresses, based on the accumulated loadings anticipated in the life of a structure.

E-rated lumber—lumber graded for use in manufacturing glued-laminated timber by nondestructive measurement of a modulus of elasticity (E), and by visual inspection in accordance with the grading rules of the applicable grading or inspection agency.

earlywood—the less dense, large-celled, part of the growth layer formed first during the annual growth cycle; a synonym for *springwood*.

equilibrium moisture content—a moisture content at which wood neither gains nor loses moisture to the surrounding air.

extractives—compounds occurring in plant materials but not forming part of the structural elements, that are removed with neutral solvents such as ether, alcohol, and water.

face—the wide surface of rectangular pieces of lumber. Often the surface that determines the grade of lumber destined for remanufacture.

fiber, wood—a comparatively long ($\frac{1}{25}$ in. or less to $\frac{1}{3}$ in.), narrow, tapering wood cell closed at both ends.

fiber saturation point—the moisture content at which the cell walls are saturated with water (bound water) and no water is held in the cell cavities by capillary forces. It usually is taken as 25 % to 30 % moisture content, based on weight when oven-dry.

fire retardant—having or providing comparatively low flammability or flame spread properties.

flat grain—see **grain**.

form factor—a factor used in the calculation of the bending strength of wood members to compensate for nonrectangular shape. Defined as the ratio of the modulus of rupture of a member of desired shape to that of a “standard” member.

fracture toughness—a conventional fracture mechanics strength parameter indicating the resistance of a material to crack extension.

glued-laminated timber (glulam)—a term used to denote glued-laminated timber that is a product made from suitable selected and prepared pieces of wood bonded together with an adhesive wither in a straight or curved form with the grain of all pieces essentially parallel to the longitudinal axis of the member.

grade—the designation of the quality of logs or of a manufactured piece of wood.

grade quality index (GQI)—a numerical assessment of the visual growth characteristics found in the sample specimens that are considered to be strength related and are limited as part of the grade description.

grain—the direction, size, arrangement, appearance, or quality of the fibers in lumber or other wood products. To have a specific meaning the term must be qualified.

chipped grain—a machine defect of surfaced lumber, where the grain of the wood has been torn out in small particles by the action of the planer knives.

close grain—(1) narrow, inconspicuous annual rings. The term is sometimes used to designate wood having small and closely spaced pores, but in this sense the term “fine textured” is more often used; and (2) in stress grading, wood averaging on one end or the other of each piece not less than six nor more than 30 annual rings per inch. Pieces averaging at least five or more than 30 rings per inch are accepted as close grain if containing one-third or more summerwood.

coarse grain—wide conspicuous annual rings in which there is considerable difference between earlywood and latewood. The term is sometimes used to designate wood with large pores, such as oak, ash, chestnut, and walnut, but in this sense the term “coarse textured” is more often used.

cross grain—fiber deviation from a line parallel to the sides of the piece. Cross grain may be either diagonal or spiral grain or a combination of the two.

curly grain—grain distortion with an irregular curled appearance; “birdseye” is an extreme case of curly grain.

diagonal grain—grain pattern in which the annual rings are at an angle with the axis of a piece as a result of sawing at an angle with the bark of the tree or log; a form of *cross grain*.

edge grain—grain pattern in which the wide surfaces of the sawn piece extend approximately at right angles to the annual growth rings. Lumber is considered edge grained when the rings form an angle of 45° to 90° with the wide surface of the piece.

end grain—the grain pattern exposed when ends of logs or timbers, dimension, boards, and other wood products are cut perpendicular to the fiber direction.

fine grain—a synonym for *close grain*.

flat grain—the grain pattern resulting when lumber has been sawed in a plane approximately perpendicular to the radius of the log. Lumber is considered flat grained when the annual growth rings make an angle of less than 45° with the surface of the piece.

interlocked grain—wood in which the fibers are inclined in one direction in a number of rings of annual growth, then gradually reverse and are inclined in an opposite direction in succeeding growth rings, then reverse again.

loosened grain—a separation or loosening of the earlywood from the latewood due to defects in the wood or processing such as planing.

medium grain—used in stress grading to denote wood averaging on one end or the other of each piece not less than four annual rings per inch.

mixed grain—lumber and other wood products unrestricted or unsegregated as to the grain angle.

open grain—(1) common classification related to finishing of woods with large pores, such as oak, ash, and chestnut; also known as “coarse textured;” and (2) used in stress grading to denote no limitations on rate of growth as measured by annual rings per inch.

plainsawn—a synonym for *flat grain*.

quartersawn—a synonym for *edge grain*.

raised grain—a condition of the surface of dressed lumber in which the hard latewood is raised above the softer earlywood but not torn loose from it.

rift sawn—a synonym for *edge grain*.

slash grain—a synonym for *flat grain*.

spiral grain—wood in which the fibers take a spiral course about the trunk of a tree instead of the normal vertical course. The spiral may extend in a right-handed or left-handed direction around the tree trunk. Spiral grain is a form of cross grain.

straight-grained wood—wood in which the fibers run parallel to the axis of a piece.

torn grain—a machine defect of surfaced lumber, where the fibers of the wood have been torn out around knots and curly places by the action of the planer knives.

vertical grain—a synonym for *edge grain*.

wavy-grained wood—wood in which the fibers form a pattern of fairly uniform waves or undulations.

green—(1) freshly sawed wood, or wood that has received no drying; unseasoned. Lumber that may have become wet to above the fiber saturation point may be referred to as being in the “green condition;” and

(2) wood above a stipulated moisture content, as lumber above 19 % moisture content in accordance with the American Softwood Lumber Standard.

hardness—a term relating to the capacity of wood to withstand denting and abrasion; for purposes of comparison, hardness in wood is often measured as the load in pounds required to embed a 0.444-in. ball to one-half its diameter (Test Methods D143).

hardwood dimension—hardwood stock processed to the specified thickness, width, and length, or in multiples thereof.

hardwoods—generally one of the botanical groups of trees that have broad leaves in contrast to the conifers or softwoods. The term has no reference to the actual hardness of the wood.

heartwood—the inner layer of a woody stem wholly composed of nonliving cells and usually differentiated from the outer enveloping layer (sapwood) by its darker color. It is usually more decay resistant than sapwood.

holes—openings in or through lumber that may extend partially or entirely through a piece and may be from any cause.

honeycomb—advanced stage of decay caused by *Fomes pini*. D9-09a

honeycombing—in lumber and other wood products, separation of the fibers in the interior of the piece, usually along the wood rays. The failures often are not visible on the surfaces, although they can be the extensions of surface and end checks.

horizontal shear—shear that occurs in planes parallel to the longitudinal axis of the member; sometimes referred to as longitudinal shear.

impact bending—application of an impact load in bending to obtain a measure of the ability of wood to absorb shock loads.

in-grade—samples collected from lumber grades as commercially produced. Samples collected in this manner are intended to represent the full range of strength and modulus of elasticity values normally found within a grade.

incise—to make slitlike lacerations generally parallel to the grain in the lateral surface of timbers that are resistant to treatment, so that deeper and more uniform penetration of preservative may be obtained.

increment borer—an augerlike instrument with a hollow bit, used to extract cores from trees for study of growth and age and for other research purposes.

joint—the junction of two or more pieces of wood. Usually implies a structural junction in which stress is transmitted from one piece to another.

juvenile wood—the wood formed adjacent to the pith, characterized by progressive change in cell dimension, different microstructure than mature wood, and greater shrinkage parallel to the grain.

NOTE—DISCUSSION 1—In—In softwoods, juvenile wood is characterized by lower specific gravity and strength. It may vary in quantity from tree to tree and extend from the pith 5 to 20 growth rings.

kiln—a chamber used for drying and conditioning lumber, veneer, and other wood products in which the temperature and relative humidity of the circulated air can be varied and controlled, often steam heated and vented.

kiln schedule—in kiln drying, the time schedule of predetermined or actual dry-bulb and wet-bulb temperatures used in drying a kiln charge of lumber or other wood products.

- knot**⁴—that portion of a branch or limb which has been surrounded by subsequent growth of the wood of the tree. As a knot appears on the cut surface it is merely a section of the entire knot, its shape depending upon the direction of the cut.
- branch knots*—two or more knots diverging from a common point at or near the pith.
- decayed knot*—a knot that, due to advanced decay, is softer than the surrounding wood.
- edge knot*—(1) a knot located at the edge of the face in a piece of lumber; and (2) in stress grading under Practice D245, a knot whose perimeter falls within one-sixth of the knot width from the edge of the piece. The knot width is measured along a line transverse to the piece.
- encased knot*—a knot whose rings of annual growth are not intergrown with those of the surrounding wood.
- firm knot*—a knot that is solid across its face, but which contains incipient decay.
- fixed knot*—a knot that will hold its place in dry lumber under ordinary conditions, but can be moved under pressure, although not easily pushed out.
- group knots*—two or more single knots grouped together.
- intergrown knot*—a knot whose rings of annual growth are completely intergrown with those of the surrounding wood.
- knot cluster*—two or more knots grouped together as a unit, the fibers of the wood being deflected around the entire unit. Distinct from a group of single knots in which each is a unit.
- loose knot*—a knot that is not held firmly in place by growth or position and that cannot be relied upon to remain in place.
- pith knot*—a sound knot having a pith hole not over ¼ in. in diameter.
- round knot*—a knot that is cut at approximately right angles to its long axis of the limb.
- single knot*—a knot having adjoining wood fibers deflected around it alone and not around another knot.
- sound knot*—a knot that is solid across its face, at least as hard as the surrounding wood, and shows no indication of decay.
- spike knot*—a knot cut at from 0° to 45° to the long axis of the limb.
- tight knot*—a knot so fixed by growth or position that it will firmly retain its place in the piece.
- unsound knot*—a knot which is not solid across the face as a result of decay and is not as hard as the surrounding wood.
- laminated strand lumber (LSL)**—a composite of wood strand elements with wood fibers primarily oriented along the length of the member. The least dimension of the strands shall not exceed 0.10 in. (2.54 mm) and the average length shall be a minimum of 150 times the least dimension.
- laminated veneer lumber (LVL)**—a composite of wood veneer sheet elements with wood fibers primarily oriented along the length of the member. Veneer thickness shall not exceed 0.25 in. (6.4 mm).
- latewood**—the denser, smaller-celled, later-formed part of a growth layer; a synonym is *summerwood*.
- lath**—thin, narrow strips of rough wood.
- log**—a section of the trunk of a tree usually referring to a length suitable for conversion to commercial products.
- log run**—in relation to lumber manufacture in softwoods, the total yield of a log or group of logs in lumber without any grading; in hardwood, certain lower grades are excluded.
- log scale**—the measure of the potential lumber content of a log or logs based on particular cuttings and sizes, with the measure varying according to the exact nature of the log scale or log rule involved.
- longitudinal**—generally, the direction parallel to the grain of wood; sometimes the long axis of a wood specimen.
- lower tail**—a portion of an ordered data set consisting of all test specimens with the lowest property values (for example, lowest strengths).
- lumber**—the product of the sawmill and planing mill usually not further manufactured other than by sawing, resawing, passing lengthwise through a standard planing machine, crosscutting to length, and matching.
- blanked lumber*—lumber planed to a size in excess of the corresponding standard-dressed size to permit remanufacture or special use.
- boards*—lumber less than 2 in. in nominal thickness. Boards less than 6 in. in width may be classified as strips.
- common lumber*—in softwoods, a general term for nonstress graded lumber that has appearance quality less than select grade but is suitable for general construction and utility purposes.
- dimension*—lumber from nominal 2 in. through 4 in. thick and 2 in. or more wide.
- dressed lumber*—lumber that is surfaced by a planing machine on one side (S1S), two sides (S2S), one edge (S1E), two edges (S2E), or any combination of sides and edges (S1S1E, S2S1E, S1S2E, or S4S). Dressed lumber may also be referred to as planed or surfaced.
- dressed size*—the dimensions of lumber after surfacing with a planing machine. Usually ¼ or ¾ in. less than nominal size. The American Softwood Lumber Standard lists standard dressed sizes.
- finish*—lumber suitable for millwork or for the completion of the interior of a building. Chosen particularly because of appearance or ability to accept a high quality finish.
- framing lumber*—lumber used for the structural members of a building, such as studs and joists.
- plain end lumber*—worked lumber without end matching or with plain trimming and square ends.
- planed lumber*—see *dressed lumber*.

⁴ Information covering the interpretation of knot measurement is given in Appendix X1.