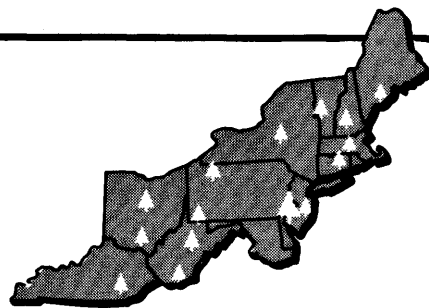


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A SUGGESTED GLOSSARY OF TERMS AND STANDARDS FOR MEASURING WOOD AND BARK MILL RESIDUES

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Abstract.—Current information about wood and bark residues lacks the consistency needed to enable complete understanding and comparison from source to source. To make information about wood and bark residues more useful for production and marketing decisions, the Forest Products Marketing Laboratory of the USDA Forest Service and the Tennessee Valley Authority prepared this glossary of terms and standards for measuring wood and bark mill residues. The International System of Units (SI) is recommended as standard practice for workers in this field. Related conversion factors and principles for the use of SI are presented.

The present emphasis on environmental concerns has brought with it an increasing need for information about wood and bark residues. Unused residues can be valuable raw materials for fuel and for the manufacture of pulp, particleboard, fiberboard, charcoal, and agricultural mulches and bedding materials.

Recognizing the value of residues as an energy source and as raw material, timber industries are asking for estimates of types and qualities of residues available. Utilization specialists are seeking to determine how much sawdust, shavings, bark, slabs, and so

forth are available for industrial use. Engineers are seeking answers about how much residue a plant produces so they may know what size of incinerators or other disposal apparatus to specify.

Though much data has been published on mill residues, much information of the kind needed is not available, is not suitable in the terms given, or is not comparable from source to source. For example, of seven references recently consulted on the amount of hardwood bark residue produced in debarking, two made no mention of the moisture contents at which weights were taken, three did

not fully explain how conversion factors were arrived at, and no two were directly comparable due to differences in definitions, assumptions, methodology, and presentation.

The Forest Products Marketing Laboratory of the USDA Forest Service, in cooperation with the Tennessee Valley Authority, realized that sound production and marketing decisions would require more meaningful and useful reporting on wood and bark residues. As a first step we undertook a project to standardize terms, definitions, and units of measure. The project scope was limited to collecting and publishing standards that would have broad application in measuring residues or byproducts from wood-processing plants. Two objectives were to establish (1) definitions for applicable terminology, and (2) standard units of measurement. In fulfillment of these objectives, a suggested glossary of terminology is presented here, followed by recommendations for use of the International System of Units (SI) as standard practice.

Terms and definitions were obtained from the literature and from consultation with other wood technologists. Twenty-three people in industry, education, and government in the United States and Canada contributed review comments and helpful suggestions; so this glossary represents the thinking and experience of technologists and wood users with a wide range of experience.

Where customary units of measure appear in the glossary, the recommended SI units follow in parentheses.

Glossary

ACTUAL BOARD MEASURE—Lumber measurement according to actual board dimensions.

AIR-DRIED—(adj.) A general term applied to wood or bark seasoned or dried to equilibrium moisture content by exposure to air, usually in a yard and without supplemental heat. It is most useful when stated with the percentage moisture content (ovendry basis) Abbreviated AD.

AIR-DRY—(v.) To dry a material to equilibrium moisture content.

ANGLE OF REPOSE—The angle of maximum slope at which a heap of any aggregate material will stand without sliding. Indicative of the flowability of a bulk material.

BACKING BOARD—In veneer slicing or sawing, that part of the flitch that is used for dogging and remains as a board at the end of the cutting operation.

BAG EQUIVALENT—3 cubic feet (0.084-m³) of uncompacted material.

BARK—All peripheral tissues of tree stems, branches, and roots outside the vascular cambium, composed of an inner living part (inner bark) and an outer layer of dry, dead tissues (outer bark).

BARK AGE—Length of time that bark has been stored in piles after removal from logs.

BARK, BASE—Any bark used on top of the soil as a mulch that is not primarily decorative. It can contain up to 10 percent wood. It is often used as a base over which a more expensive and decorative mulch is applied.

BARK, INNER—The physiologically active layer of tissues between the cambium and last-formed periderm or protective layer of outer bark. [Syn. phloem.]

BARK, OUTER—The layer of dead tissue, of a dry corky nature, outside the last-formed periderm or protective layer. [Syn. rhytidome.]

BARK, RAW—Bark residues as removed from logs, without further treatment.

BARK, WHOLE—Nontechnical term meaning all the bark tissue, including both inner and outer bark. [Syn. bark.]

BARKING—Syn. debarking.

BLOCK—Log or bolt from which veneer is peeled on a veneer lathe.

BLOCK, END—End trim cut from turnings or shingle bolts.

BOARD FOOT—A unit of lumber-volume measure based on the nominal dimensions of

a piece of wood 1 foot long, 1 foot wide, and 1 inch thick, or its cubic equivalent (0.00236-m^3). Abbreviated fbm.

BOARD MEASURE—Lumber measured in board feet. Abbreviated bm.

BONEDRY—(adj.) Syn. Oven-dry. Abbreviated b.d.

BULK DENSITY—Weight per unit volume of an aggregate material at a specific moisture content and compaction ratio.

CHIPS, METALLURGICAL—Wood chips produced to specifications for use in the metallurgical industry.

CHIPPABLE RESIDUE—Wood residue capable of being chipped for some specific use.

CHIPS, PULP—Wood chips produced to specifications for use by pulpmills.

CHIPS, WOOD—Wood particles of various small sizes produced by processing solid wood through chipping machines.

CLIPPING, VENEER—A piece of veneer sheared off in the process of dimensioning dry or green veneers at the clipper.

COMPACTION RATIO—The original volume of a material divided by the volume after being compacted.

COMPOSTED—Converted into compost by piling in a way that encourages decomposition.

CONVERSION FACTOR—A constant used to change a given quantity in a particular unit to an equivalent quantity in another unit.

CORD, LONG—A pile of stacked roundwood (or roughly split pieces) in 5-foot (1.52 m) lengths occupying approximately 160 gross cubic feet (4.48 m^3) of space.

CORD, STANDARD—A pile of stacked roundwood (or roughly split pieces) occupying 128 gross cubic feet (3.58 m^3) of space; generally sticks 4 feet (1.22 m) long, stacked in a pile 4 feet (1.22 m) high and 8 feet (2.44 m) long. Abbreviated cd.

CORE, STAVE BOLT—A solid wood piece left after staves have been sawed from a stave bolt.

CORE, VENEER—The center portion of the veneer log or bolt remaining after veneer has been peeled. [Syn. core block.]

CULL—(1) The deduction from gross volume of a tree or log made to adjust for defect; (2) Any item of production that does not meet specifications.

CUNIT—A unit of volume measure containing 100 cubic feet (2.8 m^3) of solid wood. Used for hogged fuel made from mill waste, pulp chips, wood and bark residues, and as a measure of log volume, especially pulpwood.

DEBARKING—The process of removing bark from logs.

DECORATIVE BARK—Softwood or hardwood bark used as a mulch primarily for its decorative qualities.

DENSITY—The mass of any substance per unit of volume.

EDGE TRIM—See edging.

EDGING—A strip removed from the edge of lumber to square the board and improve the grade. [Syn. edge trim.]

EDGING, STAVE—A strip removed from the edges of rough staves to square edges and eliminate sapwood.

END TRIM—See trimming, lumber.

EQUALIZING BLOCK—The end trim from stave bolts.

EQUILIBRIUM MOISTURE CONTENT—The moisture content at which a material neither gains nor loses water when surrounded by air at a given relative humidity and temperature. Abbreviated EMC.

FINES—General term for particles of wood or bark too small for use in the manufacture of a specific product.

FISHTAIL—A piece of usable veneer, less than 8 feet (2.44 m) long, produced during block roundup on the veneer lathe.

FISHTAIL TRIM—Trim from cutting veneer out of fishtails; it is usually dry.

FLAKE—A small wood particle produced by slicing wood approximately parallel to the grain direction, in overall character resembling a small piece of veneer. Flakes are not usually residue.

GREEN—General term applied to unseasoned wood; above the fiber-saturation point.

GROWING MEDIUM—Material used as a substrate for rooting plants. Sawdust and bark are often used in varying proportions with soil and other materials for growing medium.

HOGGED FUEL—Hogged residue for use as fuel.

HOGGED RESIDUE—Wood and bark residues from manufacturing operations, prepared by processing through an industrial-type hog or hammermill.

INNER BARK—See bark, inner.

INTERNATIONAL LOG RULE, 1/4-INCH (6.35 mm) KERF—A method of estimating the board feet of seasoned lumber that can be sawed from logs of a given small-end diameter. It is computed by the formula $V = (0.22D^2 - 0.71D) (0.905)$ in 4-foot (1.22 m) sections, assuming a 1/2-inch (12.7 mm) taper per section, and a 1/4-inch (6.35 mm) kerf, where V = volume in board feet and D = small-end diameter inside bark, in inches.

INTERNATIONAL SYSTEM OF UNITS—Système International d' Unités. A version of the metric system worked out with international cooperation, the use of which is recommended to standardize units of measurement worldwide. It has the following basic units of measurement: meter (m), kilogram (kg), second (s), ampere (A), kelvin (K), and candela (cd) for the base quantities; length, mass, time, electric current, thermodynamic temperature, and luminous intensity. [Abbreviated SI. See metric system.]

KILN-DRIED—(adj.) A general term applied to wood seasoned or dried in a kiln with the use of supplementary heat, moving air,

and often humidification. It is most useful when stated with the percentage moisture content. Abbreviated KD.

KILN-DRY—(v.) To dry material in a kiln with the use of supplementary heat, air movement, and humidity.

LILY PAD—An end trimming from a log.

LOG, PEELER—A log suitable for the manufacture of rotary-cut veneer. [Syn. veneer log.]

LOG RULE—A table or formula for estimating the board feet of 4/4 [1 inch (25.4 mm)] lumber that can be sawed from logs of given length and diameter, given a kerf width. Of the many log rules, the International Rule is generally recognized to give the most consistently accurate estimates of the board feet of lumber that can be sawed from a log. In scientific work it is preferred.

LOG, SAW—A log large enough to produce lumber or other products by sawing.

LOG SCALE—The estimated volume of a log or group of logs, based on a specific log rule.

LOOSE FILLED—Syn. uncompacted.

LUMBER TALLY—A record of lumber by number of boards or pieces by size, grade, and species.

MESH—Designation for screen size in terms of the number of openings per linear inch (25.4 mm).

METRIC SYSTEM—A decimal system of weights and measures, using the gram, meter, and liter as basic units of weight, length, and capacity. See International System of Units.

MOISTURE CONTENT—The weight of water contained in a material, generally expressed as a percentage of the material's oven-dry weight (oven-dry basis). This figure can be greater than 100 percent. It can also be expressed as a percentage of the material's green weight (green basis). The basis for calculation should always accompany the term. Abbreviated MC.

MULCH—Any material spread on top of the soil around plants to conserve soil moisture, insulate plant roots, and reduce weed growth.

NUGGETS, BARK—A commercial term used for 1- to 3-inch (25.4 to 76.2 mm) bark chunks used as a mulch and usually considered as being decorative.

OFFAL—Syn. wood residue.

OUTER BARK—See bark, outer.

OVENDRY—(adj.) Dried to a constant weight in an oven at 105°C (221°F). Abbreviated OD.

OVEN-DRY—(v.) To dry a material to a constant weight in an oven at 105°C (221°F).

OVERSIZE—Residue particles too large to meet their use specifications.

PAD—Partially air dried.

PANEL TRIM—Trim cut from the edges of plywood in the process of squaring and dimensioning a panel; it consists of dry veneer and some glue.

PARTICLE - SIZE CLASSIFICATION — A system to define the distribution of particle sizes in an aggregate material.

RELATIVE HUMIDITY—The ratio of actual vapor pressure to saturated vapor pressure at the same temperature.

RESIDUE, BARK—Bark and wood fragments removed from roundwood forest products as a result of the debarking process.

RESIDUE, COARSE—Solid-wood leftover material produced in the course of timber-processing operations; for example, slabs, edgings, trimmings, log-end trimmings (lily-pads), veneer cores, green veneer clippings, culled stave bolts, etc.

RESIDUE, FINE—Small wooden leftovers produced in the course of wood-product manufacturing; for example, sawdust, shavings, chip screenings, spur trim, turnings, rossings, and sander dust; sometimes bark residues are included.

RESIDUE, WOOD—Wood (in all forms) left over from manufacturing operations, not utilized in products.

ROSSING—A splinter-like particle produced by pole- and post-shaving machines in dressing debarked wooden poles and posts. Rossings consist of wood particles and the remains of bark (mainly inner bark).

ROUNDING RESIDUE—All veneer less than 4 feet (1.22 m) long produced in rounding veneer blocks. [Syn. roundup.]

SANDER DUST—Small, dry wooden particles removed in wood sanding operations. It usually contains abrasive particles as well.

SAWDUST—Wood particles resulting from the cutting and breaking action of saw teeth, finer than chips but coarser than wood flour.

SHAVINGS—Small, thin slices of wood, usually curled, that develop from wood-machining operations such as planing, molding, shaping, boring, routing, and turning.

SHINGLE TOW—Shredded wood generated from the shingle saw as residue from the manufacture of shingles.

SHREDDED BARK—Bark reduced to a stringy nature, generally of hardwoods, and used as a mulch, especially in areas such as slopes where wind and rain tend to move other mulches.

SLAB—The exterior portion of a log removed by sawing for lumber.

SOIL AMENDMENT—See soil conditioner.

SOIL CONDITIONER—Material added in varying proportions to soil to improve its physical properties for growing plants.

SPALT—A small piece of excelsior or shingle bolt that cannot be used entirely in excelsior machines or for shingles.

SPECIFIC GRAVITY—The ratio of the ovendry weight of a certain volume of substance to the weight of an equal volume of water at 4°C (39°F). [Abbreviated sp. gr.]

SPLINTS—Edge trim from shingles.

SPUR TRIM—Trim cut from sides of veneer as it comes from a rotary lathe.

SQUARE FOOT OF PLYWOOD—A volume measure of plywood equivalent to 1 square foot of surface measure by some stated thickness, usually $\frac{3}{8}$ inch (9.53 mm).

THIN LUMBER—Lumber thinner than the specifications called for in its intended use.

TON, LONG—A weight equal to 2,240 pounds (1017 kg).

TON, METRIC—A weight equal to 1000 kilograms or 2,205 pounds. [Syn. tonne.]

TON, SHORT—A weight equal to 2,000 pounds (908 kg).

TRIMMING, LOG—The end portion of a log removed by sawing for length or to remove defects. [Syn. lily pad.]

TRIMMING, LUMBER—The end portions of boards removed by sawing for length or to remove defects. [Syn. end trim.]

UNCOMPACTED—An indefinite term expressing a low degree of compaction of an aggregate material. The term should be qualified in each instance. For example, gravity-filled from not more than 4 feet (1.22 m) above top of pile.

UNIT—(1) A measure of aggregate material (pulp chips, hogged fuel, bark, or sawdust) having a gross cubic content of 200 cubic feet (5.6 m³) uncompact. When used for pulp chips, it has little meaning unless qualified by a factor for solid wood content or oven-dry weight [often considered as equivalent to 2,400 pounds (1090 kg)]. It is approximately equivalent to a standard cord (3.58 m³) of

sawmill residues. Abbreviated u. (2) In the South, a 168-gross-cubic-foot (4.70 m³) [160-gross-cubic-feet (4.48 m³) trim not included] stack of roundwood with pieces 5 feet 3 inches long piled 4 feet high and 8 feet long.

VENEER CLIPPING—See clipping, veneer.

VENEER CORE—See core, veneer.

WOOD—The lignified water-conducting, strengthening, and storage tissues of branches, stems, and roots of trees, lying between the pith and the cambium. [Syn. xylem.]

WOOD FLOUR—Very fine wood particles ground until they resemble wheat flour, and of such size that the particles usually will pass through a 40-mesh screen.

WOOD LOSS—Wood removed from the log during debarking and not recovered.

WOOD RESIDUE—See residue, wood.

WOOD WASTE—All unusable wood residue that necessitates a net expenditure for disposal.

International System of Units

Inasmuch as a bill is before the Congress for the United States to change to the International System of Units (SI), and many institutions are already in the process of change, we suggest that workers in the field of wood and bark residues become familiar with and use this system as soon as possible. To this end I have included basic information on SI that is appropriate for measuring wood and bark residues. The following tabulation shows some customary and SI units, their symbols, and conversion factors to facilitate changes from one system to the other.

Length

1 inch (in) = 25.4 millimeters (mm)
1 foot (ft) = 0.3048 meter (m)
1 mile (mi) = 1.609 kilometers (km)

1 mm = 0.039 in
1 m = 3.281 ft
1 km = 0.621 mi

Mass

1 avoirdupois ounce (oz avdp) = 28.350 grams (g)
1 avoirdupois pound (lb avdp) = 0.454 kilogram (kg)

1 g = 0.035 oz avdp
1 kg = 2.205 lb avdp

Area

1 square inch (in²) = 6.452 square centimeters (cm²)
1 square foot (ft²) = 0.093 square meter (m²)
1 acre (acre) = 0.405 hectare (ha)

1 cm² = 0.155 in²
1 m² = 10.764 ft²
1 ha = 2.471 acres

Capacity or Volume

1 cubic inch (in³) = 16.387 milliliters (ml)
1 cubic foot (ft³) = 0.028 cubic meters (m³)
1 cubic yard (yd³) = 0.765 m³
1 board foot (fbm) = 0.00236 m³

1 ml = 0.061 in³
1 m³ = 35.315 ft³
1 m³ = 1.308 yd³
1 m³ = 423.776 fbm

Decimal multiples and submultiples are formed by using the following factors with SI base units and are labelled by the appropriate prefixes or prefix symbols. The SI base units that concern us here are the meter and kilogram. Since the kilogram already has a prefix, names of decimal multiples and submultiples of the unit of mass are formed by adding prefixes to the word **gram**.

Factor	Prefix	Symbol
10 ¹²	tera	T
10 ⁹	giga	G
10 ⁶	mega	M
10 ³	kilo	k
10 ²	hecto	h
10 ¹	deka	da
10 ⁻¹	deci	d
10 ⁻²	centi	c
10 ⁻³	milli	m
10 ⁻⁶	micro	μ
10 ⁻⁹	nano	n
10 ⁻¹²	pico	p
10 ⁻¹⁵	femto	f
10 ⁻¹⁸	atto	a

According to the most recent information from the National Bureau of Standards, the following general principles apply in using SI. These principles were taken from the International System of Units, 1972 edition, Units of Weight and Measure, National Bureau of Standards Miscellaneous Publication 286; and International Organization for Standardization (ISO) Standard 1000, 1973 edition. Several principles were taken verbatim, and others were condensed or expanded.

- (1) No period is used with symbols for units except at the end of a sentence.
Example: m, kg
- (2) The exponents "2" and "3" are used to signify "square" and "cubic" respectively, instead of the symbols "sq" or "cu".
Example: m²
- (3) The same symbol is used for both singular and plural.
Example: 1 m, 2 m
- (4) There should be no spacing between the prefix and the unit that it qualifies, whether names or symbols are used.
Examples: millimeter, mm

- (5) An exponent attached to a symbol containing a prefix indicates that the multiple or submultiple of the unit is raised to the power expressed by the exponent.
Examples: $1\text{cm}^3 = 10^{-6}\text{m}^3$,
 $1\text{cm}^{-1} = 10^2\text{m}^{-1}$
- (6) Two or more SI prefixes are not to be used together.
Example: 1nm , not $1\text{m}\mu\text{m}$
- (7) A space is left between numerals and SI names and symbols.
Example: 47.7 kg , not 47.7kg
- (8) In numbers, the comma (French practice) or the dot (British and U. S. practice) are used only to separate the integral part of numbers from the decimal part. Numbers may be divided in groups of three by a space in order to facilitate reading; neither dots nor commas are ever inserted in the spaces between groups.
Example: $9\ 342\ 770.66$
- (9) In order to avoid errors in calculations it is essential to use coherent units. Therefore, it is strongly recommended that in calculations only SI units themselves be used, and not their decimal multiples and submultiples.
- (10) The use of units with prefixes representing 10 raised to a power which is a multiple of 3 is especially recommended.
Example: refrain from using units with the prefixes hecto, deka, deci, and centi.
- (11) It has been found suitable in most applications to choose units that are decimal multiples and submultiples that result in numerical values between 0.1 and 1000 .
- (12) In tabulated values that extend over a considerable range, it is appropriate to use the same units, even when this means exceeding the preferred value range of 0.1 to 1000 .

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