



# Commercial Lumber, Round Timbers and Ties

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# Commercial Lumber, Round Timbers, and Ties

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When sawn, a log yields round timber, ties, or lumber of varying quality. This chapter presents a general discussion of grading, standards, and specifications for these commercial products.

In a broad sense, commercial lumber is any lumber that is bought or sold in the normal channels of commerce. Commercial lumber may be found in a variety of forms, species, and types, and in various commercial establishments, both wholesale and retail. Most commercial lumber is graded by standardized rules that make purchasing more or less uniform throughout the country.

Round timbers and ties represent some of the most efficient uses of our forest resources. They require a minimum of processing between harvesting the tree and marketing the structural commodity. Poles and piles are debarked or peeled, seasoned, and often treated with preservative prior to use as structural members. Construction logs are usually shaped to facilitate construction. Ties, used for railroads, landscaping, and mining, are slab-cut to provide flat surfaces. Because these products are relatively economical to produce compared with glulam, steel, and concrete products, they are commonly used throughout the United States.

To enable users to buy the quality that best suits their purposes, lumber, round timbers, and ties are graded into use categories, each having an appropriate range in quality.

Generally, the grade of a piece of wood is based on the number, character, and location of features that may lower its strength, durability, or utility value. Among the more common visual features are knots, checks, pitch pockets, shake, and stain, some of which are a natural part of the tree. Some grades are free or practically free from these features. Other grades, which constitute the great bulk of solid wood products, contain fairly numerous knots and other features. With proper grading, lumber containing these features is entirely satisfactory for many uses.

The grading operation for most solid wood products takes place at the sawmill. Establishment of grading procedures is largely the responsibility of manufacturers' associations. Because of the wide variety of wood species, industrial practices, and customer needs, different grading practices coexist. The grading practices of most interest are considered in the sections that follow, under the major categories of hardwood lumber and softwood lumber, round timbers, and ties.

## Hardwood Lumber

The principal use of hardwood lumber is for remanufacture into furniture, cabinetwork, and pallets or direct use as flooring, paneling, moulding, and millwork. Hardwood lumber is graded and marketed in three main categories: Factory lumber, dimension parts, and finished market products. Several hardwood species are graded under the American Softwood Lumber Standard and sold as structural lumber (Chap. 7). Also, specially graded hardwood lumber can be used for structural glued-laminated lumber.

Prior to 1898, hardwoods were graded by individual mills for local markets. In 1898, manufacturers and users formed the National Hardwood Lumber Association to standardize grading for hardwood lumber. Between 1898 and 1932, grading was based on the number and size of visual features. In 1932, the basis for grading was changed to standard clear-cutting sizes.

Both Factory lumber and dimension parts are intended to serve the industrial customer. The important difference is that for Factory lumber, the grades reflect the proportion of a piece that can be cut into useful smaller pieces, whereas the grades for dimension parts are based on use of the entire piece. Finished market products are graded for their unique end-use with little or no remanufacture. Examples of finished products include moulding, stair treads, and hardwood flooring.

### Factory Lumber

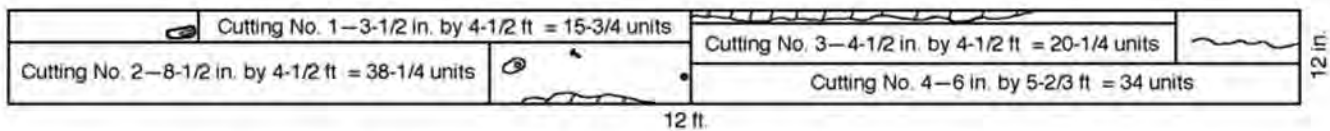
#### Grades

The rules adopted by the National Hardwood Lumber Association are considered standard in grading hardwood lumber

intended for cutting into smaller pieces to make furniture or other fabricated products. In these rules, the grade of a piece of hardwood lumber is determined by the proportion of a piece that can be cut into a certain number of smaller pieces of material, commonly called cuttings, which are generally clear on one side, have the reverse face sound, and are not smaller than a specified size.

The best grade in the Factory lumber category is termed FAS (Firsts and Seconds). The second grade is F1F (FAS one face). The third grade is Selects, which is followed by No. 1 Common, No. 2A Common, No. 2B Common, No. 3A Common, No. 3B Common, and Sound Wormy. Except for F1F and Selects, the poorer side of a piece is inspected for grade assignment. Standard hardwood lumber grades are described in Table 6-1. This table illustrates, for example, that FAS includes pieces that will allow at least 83-1/3% of their surface measure to be cut into clear face material. Except for Sound Wormy, the minimum acceptable length, width, surface measure, and percentage of piece that must work into a cutting decrease with decreasing grade. Figure 6-1 is an example of grading for cuttings.

This brief summary of grades for Factory lumber should not be regarded as a complete set of grading rules, because many details, exceptions, and special rules for certain species are not included. The complete official rules of the National Hardwood Lumber Association (NHLA) should be followed as the only full description of existing grades (see Table 6-2 for addresses of NHLA and other U.S. hardwood grading associations). Table 6-3 lists names of commercial domestic hardwood species that are graded by NHLA rules.



1. Determine Surface Measure (S.M.) using lumber scale stick or from formula:

$$\frac{\text{Width in inches} \times \text{length in feet}}{12} = \frac{12 \text{ in.} \times 12 \text{ ft}}{12}$$

= 12 ft<sup>2</sup> S.M.

2. No. 1 Common is assumed grade of board. Percent of clear-cutting area required for No. 1 Common—66<sup>2</sup>/<sub>3</sub>% or <sup>8</sup>/<sub>12</sub>.

3. Determine maximum number of cuttings permitted.

$$\text{For No. 1 Common grade (S.M. + 1) } \div 3$$

$$= \frac{(12 + 1)}{3} = \frac{13}{3} = 4 \text{ cuttings.}$$

4. Determine minimum size of cuttings.

For No. 1 Common grade 4 in. x 2 ft or 3 in. x 3 ft.

5. Determine clear-face cutting units needed.

$$\text{For No. 1 Common grade S.M.} \times 8 = 12 \times 8$$

$$= 96 \text{ units}$$

6. Determine total area of permitted clear-face cutting in units.

Width in inches and fractions of inches  
x length in feet and fractions of feet

$$\text{Cutting \#1—} 3\frac{1}{2} \text{ in.} \times 4\frac{1}{2} \text{ ft} = 15\frac{3}{4} \text{ units}$$

$$\text{Cutting \#2—} 8\frac{1}{2} \text{ in.} \times 4\frac{1}{2} \text{ ft} = 38 \text{ units}$$

$$\text{Cutting \#3—} 4\frac{1}{2} \text{ in.} \times 4\frac{1}{2} \text{ ft} = 20\frac{1}{4} \text{ units}$$

$$\text{Cutting \#4—} 6 \text{ in.} \times 5\frac{2}{3} \text{ ft} = 34 \text{ units}$$

$$\text{Total Units} \quad 108$$

Units required for No. 1 Common—96.

7. Conclusion: Board meets requirements for No. 1 Common grade.

Figure 6-1. Example of hardwood grading for cuttings using No. 1 Common lumber grade. Current grading rules are written only in the inch-pound system of measurement. Standard lengths are in 1-ft increments.

**Table 6–1. Standard hardwood lumber grades<sup>a,b</sup>**

Grade and allowable lengths	Allowable width (in.)	Allowable surface measure of pieces (ft <sup>2</sup> )	Minimum amount of piece in clearface cuttings (%)	Allowable cuttings	
				Maximum no.	Minimum size
FAS	6+	4 to 7	83-1/3	1	4 in. by 5 ft
8 to 16 ft		6 and 7	91-2/3	2	or
and		8 to 11	83-1/3	2	3 in. by 7 ft
F1F		8 to 11	91-2/3	3	
8 to 16 ft <sup>c</sup>		12 to 15	83-1/2	3	
		12 to 15	91-2/3	4	
		16+	83-1/3	4	
Selects 6 to 16 ft	4+	2 and 3	91-2/3	1	4 in. by 5 ft
		4+	— <sup>d</sup>		or
					3 in. by 7 ft
No. 1 Common 4 to 16 ft (only 5% of minimum width is allowed)	3+	1	100	0	4 in. by 2 ft
		2	75	1	or
		3 and 4	66-2/3	1	3 in. by 3 ft
		3 and 4	75	2	
		5 to 7	66-2/3	2	
		5 to 7	75	3	
		8 to 10	66-2/3	3	
		11 to 13	66-2/3	4	
		14+	66-2/3	5	
No. 2 Common 4 to 16 ft	3+	1	66-2/3	1	3 in. by 2 ft
		2 and 3	50	1	
		2 and 3	66-2/3	2	
		4 and 5	50	2	
		4 and 5	66-2/3	3	
		6 and 7	50	3	
		6 and 7	66-2/3	4	
		8 and 9	50	4	
		10 and 11	50	5	
		12 and 13	50	6	
		14+	50	7	
No. 3A Common 4 to 16 ft	3+	1+	33-1/3 <sup>f</sup>	— <sup>g</sup>	3 in. by 2 ft
No. 3B Common 4 to 16 ft	3+	1+	25 <sup>h</sup>	— <sup>g</sup>	1-1/2 in. by 36 in <sup>2</sup>
Sound Wormy <sup>e</sup>					

<sup>a</sup>Current grading rules are written only in the inch–pound system of measurement.

<sup>b</sup>Inspection made on poorer side of piece, except in Selects grade.

<sup>c</sup>FAS is a grade that designates Firsts and Seconds. F1F is a grade that designates FAS one face.

<sup>d</sup>Same as F1F, with reverse side of board not below No. 1 Common.

<sup>e</sup>Sound Wormy grade shall not be below No. 1 Common except that the natural characteristics of worm holes, bird pecks, stain, sound knot not exceeding 3/4 in. in diameter are admitted. Other sound defects that do not exceed in extent or damage the defects described are admitted in the cuttings. Unless otherwise specified, Sound Wormy shall include the full product of the log in No. 1 Common and Better Sound Wormy.

<sup>f</sup>Also admits pieces that grade not below No. 2 Common on the good face and reverse side of sound cuttings.

<sup>g</sup>Unlimited.

<sup>h</sup>Cuttings must be sound; clear face not required.

**Standard Dimensions**

Standard lengths of hardwood lumber are in 305-mm (1-ft) increments from 1.2 to 4.9 m (4 to 16 ft). Standard thickness values for hardwood lumber, rough and surfaced on two sides (S2S), are given in Table 6–4. The thickness of S1S lumber is subject to contract agreement. Abbreviations commonly used in contracts and other documents for the purchase and sale of lumber are listed at the end of this chapter.

Hardwood lumber is usually manufactured to random width. The hardwood lumber grades do not specify standard

widths; however, the grades do specify minimum width for each grade as follows:

Grade	Minimum width (mm (in.))
FAS	152 (6)
F1F	152 (6)
Selects	102 (4)
No. 1, 2A, 2B, 3A, 3B Common	76 (3)

**Table 6–2. Hardwood grading associations in United States<sup>a</sup>**

Name and address	Species covered by grading rules (products)
National Hardwood Lumber Association P.O. Box 34518 Memphis, TN 38184–0518 www.nhla.com	All hardwood species (furniture cuttings, construction lumber)
Wood Components Manufacturers Association 741 Butlers Gate, Suite 100 Marietta, GA 30068 www.woodcomponents.org	All hardwood species (hardwood furniture dimension, squares, laminated stock, interior trim, stair treads and risers)
Maple Flooring Manufacturers Association 111 Deer lake Road Suite 100 Deerfield, IL 60015 www.maplefloor.org	Maple, beech, birch (flooring)
National Oak Flooring Manufacturers Association 22 N. Front St., Suite 1080 Memphis, TN 38103 www.nofma.org	Oak, ash, pecan, hickory, pecan, beech, birch, hard maple (flooring, including prefinished)

<sup>a</sup>Grading associations that include hardwood species in structural grades are listed in Table 6–5.

If the width is specified by purchase agreement, S1E or S2E lumber is 10 mm (3/8 in.) scant of nominal size in lumber less than 203 mm (8 in.) wide and 13 mm (1/2 in.) scant in lumber ≥203 mm (≥8 in.) wide.

**Dimension and Component Parts**

The term “dimension parts” for hardwoods signifies stock that is processed in specific thickness, width, and length, or multiples thereof and ranges from semi-machined to completely machined component products. This stock is sometimes referred to as “hardwood dimension stock” or “hardwood lumber for dimension parts.” This stock should not be confused with “dimension lumber,” a term used in the structural lumber market to mean lumber standard 38 mm to less than 89 mm thick (nominal 2 in. to less than 4 in. thick).

Dimension component parts are normally kiln dried and generally graded under the rules of the Wood Components Manufacturers Association (WCMA). These rules encompass three classes of material, each of which is classified into various grades:

Hardwood dimension parts (flat stock)	Solid kiln-dried squares (rough)	Solid kiln-dried squares (surfaced)
Clear two faces	Clear	Clear
Clear one face	Select	Select
Paint	Sound	Paint
Core		Second
Sound		

Each class may be further defined as semifabricated (rough or surfaced) or completely fabricated, including edge-glued panels. The rough wood component parts are blank-sawn and ripped to size. Surfaced semifabricated parts have been

through one or more manufacturing stages. Completely fabricated parts have been completely processed for their end use.

**Finished Market Products**

Some hardwood lumber products are graded in relatively finished form, with little or no further processing anticipated. Flooring is probably the finished market product with the highest volume. Other examples are lath, siding, ties, planks, carstock, construction boards, timbers, trim, moulding, stair treads, and risers. Grading rules promulgated for flooring anticipate final consumer use and are summarized in this section. Details on grades of other finished products are found in appropriate association grading rules.

Hardwood flooring generally is graded under the rules of the Maple Flooring Manufacturers Association (MFMA) or the National Oak Flooring Manufacturers Association (NOFMA). Tongued-and-grooved, end-matched hardwood flooring is commonly furnished. Square-edge, square-end-strip flooring is also available as well as parquet flooring suitable for laying with mastic.

The grading rules of the Maple Flooring Manufacturers Association cover flooring that is manufactured from hard maple, beech, and birch. Each species is graded into four categories:

- First grade—one face practically free of all imperfections; variations in natural color of wood allowed
- Second grade—tight, sound knots (except on edges or ends) and other slight imperfections allowed; must be possible to lay flooring without waste
- Third grade—may contain all visual features common to hard maple, beech, and birch; will not admit voids on edges or ends, or holes over 10-mm (3/8-in.) in

## Chapter 6 Commercial Lumber, Round Timbers, and Ties

**Table 6–3. Nomenclature of commercial hardwood lumber**

Commercial name for lumber	Common tree name	Botanical name	Commercial name for lumber	Common tree name	Botanical name
Alder, red	Red alder	<i>Alnus rubra</i>	Maple, Oregon	Big leaf maple	<i>Acer macrophyllum</i>
Ash, black	Black ash	<i>Fraxinus nigra</i>	Maple, soft	Red maple	<i>Acer rubrum</i>
Ash, Oregon	Oregon ash	<i>Fraxinus latifolia</i>		Silver maple	<i>Acer saccharinum</i>
Ash, white	Blue ash	<i>Fraxinus quadrangulata</i>	Oak, red	Black oak	<i>Quercus velutina</i>
	Green ash	<i>Fraxinus pennsylvanica</i>		Blackjack oak	<i>Quercus marilandica</i>
	White ash	<i>Fraxinus americana</i>		California black oak	<i>Quercus kelloggi</i>
Aspen (popple)	Bigtooth aspen	<i>Populus grandidentata</i>		Cherrybark oak	<i>Quercus falcata</i> var. <i>pagodaefolia</i>
	Quaking aspen	<i>Populus tremuloides</i>		Laurel oak	<i>Quercus laurifolia</i>
Basswood	American basswood	<i>Tilia americana</i>		Northern pin oak	<i>Quercus ellipsoidalis</i>
	White basswood	<i>Tilia heterophylla</i>		Northern red oak	<i>Quercus rubra</i>
Beech	American beech	<i>Fagus grandifolia</i>		Nuttall oak	<i>Quercus nuttallii</i>
Birch	Gray birch	<i>Betula populifolia</i>			<i>Quercus palustris</i>
	Paper birch	<i>Betula papyrifera</i>			<i>Quercus coccinea</i>
	River birch	<i>Betula nigra</i>			<i>Quercus shumardii</i>
	Sweet birch	<i>Betula adusta</i>			<i>Quercus falcata</i>
	Yellow birch	<i>Betula alleghaniensis</i>			<i>Quercus laevis</i>
Boxelder	Boxelder	<i>Acer negundo</i>			<i>Quercus phellos</i>
Buckeye	Ohio buckeye	<i>Aesculus glabra</i>			<i>Quercus arizonica</i>
	Yellow buckeye	<i>Aesculus flava</i>			<i>Quercus douglasii</i>
Butternut	Butternut	<i>Juglans nigra</i>			<i>Quercus macrocarpa</i>
Cherry	Black cherry	<i>Prunus serotina</i>			<i>Quercus lobata</i>
Chestnut	American chestnut	<i>Castanea dentata</i>			<i>Quercus prinus</i>
Cottonwood	Balsam poplar	<i>Liquidambar styraciflua</i>			<i>Quercus muehlenbergii</i>
	Eastern cottonwood	<i>Populus deltoides</i>			<i>Quercus emoryi</i>
	Black cottonwood	<i>Populus nigra</i>			<i>Quercus gambelii</i>
Cucumber	Cucumbertree	<i>Asplenium platyneuron</i>			<i>Quercus oblongifolia</i>
Dogwood	Flowering dogwood	<i>Cornus florida</i>			<i>Quercus virginiana</i>
	Pacific dogwood	<i>Cornus nuttallii</i>			<i>Quercus garryana</i>
Elm, rock	Cedar elm	<i>Ulmus crinitus</i>			<i>Quercus lyrata</i>
	Rock elm	<i>Ulmus americana</i>			<i>Quercus stellata</i>
	September elm	<i>Ulmus serotinus</i>			<i>Quercus michauxii</i>
	Winged elm	<i>Ulmus alatus</i>			<i>Quercus bicolor</i>
Elm, soft	American elm	<i>Ulmus americana</i>			<i>Quercus alba</i>
	Slippery elm	<i>Ulmus rubra</i>			<i>Umbellularia californica</i>
Gum	Sweetgum	<i>Liquidambar styraciflua</i>			<i>Maclura pomifera</i>
Hackberry	Hackberry	<i>Celastrus occidentalis</i>			<i>Carya cordiformis</i>
	Sugarberry	<i>Celastrus scandens</i>			<i>Carya myristiciformis</i>
Hickory	Mockernut hickory	<i>Carya tomentosa</i>			<i>Carya aquatica</i>
	Pignut hickory	<i>Carya glabra</i>			<i>Carya illinoensis</i>
	Shagbark hickory	<i>Carya ovata</i>	Persimmon	Common persimmon	<i>Diospyros virginiana</i>
	Shellbark hickory	<i>Carya laciniosa</i>	Poplar	Yellow-poplar	<i>Liriodendron tulipifera</i>
Holly	American holly	<i>Ilex opaca</i>	Sassafras	Sassafras	<i>Sassafras albidum</i>
Ironwood	Eastern hophornbeam	<i>Ostrya virginiana</i>	Sycamore	Sycamore	<i>Platanus occidentalis</i>
Locust	Black locust	<i>Robinia pseudoacacia</i>	Tanoak	Tanoak	<i>Lithocarpus densiflorus</i>
	Honeylocust	<i>Gleditsia triacanthos</i>	Tupelo	Black tupelo, blackgum	<i>Nyssa sylvatica</i>
Madrone	Pacific madrone	<i>Arbutus menziesii</i>		Ogeechee tupelo	<i>Nyssa ogeche</i>
Magnolia	Southern magnolia	<i>Magnolia grandiflora</i>		Water tupelo	<i>Nyssa aquatica</i>
	Sweetbay	<i>Magnolia virginiana</i>	Walnut	Black walnut	<i>Juglans nigra</i>
Maple, hard	Black maple	<i>Acer nigrum</i>	Willow	Black willow	<i>Salix nigra</i>
	Sugar maple	<i>Acer saccharum</i>		Peachleaf willow	<i>Salix amygdaloides</i>

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