Janka hardness scale

Lignum vitae is the hardest wood in the USDA Wood Handbook at 4,500 lbf, followed by ipe at 3,680 lbf; the softest rated wood is ceiba at 240 lbf.

Hardness is resistance to indentation using a modified Janka test, the load required to embed a 11.28-mm (0.444-in.) ball to one-half its diameter.

NAME	BOTANICAL NAME	TYPE	ORIGIN	JANKA 12% LBF	JANKA 12% N	SG
Lignum vitae	*Guaiacum spp.*	hardwood	America	4,500	20,000	1.05 (green)
Ipe	*Tabebuia spp., lapacho group*	hardwood	America	3,680	16,400	0.92 (green)
Marishballi	*Lincania spp.*	hardwood	America	3,570	15,900	0.88 (green)
Manbarklak	*Eschweilera spp.*	hardwood	America	3,480	15,500	0.87 (green)
Azobe	*Lophira alata*	hardwood	Africa	3,350	14,900	0.87 (green)
Bulletwood	*Manilkara bidentata*	hardwood	America	3,190	14,200	0.85 (green)
Indian rosewood	*Dalbergia latifolia*	hardwood	Asia–Oceania	3,170	14,100	0.75 (green)
Macawood	*Platymiscium spp.*	hardwood	America	3,150	14,000	0.94 (green)
Kaneelhart	*Licaria spp.*	hardwood	America	2,900	12,900	0.96 (green)
Brazilian rosewood	*Dalbergia nigra*	hardwood	America	2,720	12,100	0.8 (green)
Bubinga	*Guibourtia spp.*	hardwood	Africa	2,690	12,000	0.71 (green)
Oak (tropical American, Quercus spp.)	*Quercus spp.*	hardwood	America	2,500	11,100	0.76 (green)
Jatoba (courbaril)	*Hymenaea courbaril*	hardwood	America	2,350	10,500	0.71 (green)
Greenheart	*Chlorocardium rodiei*	hardwood	America	2,350	10,500	0.8 (green)
Mora	*Mora spp.*	hardwood	America	2,300	10,200	0.78 (green)
Goncalo alves	*Astronium graveolens*	hardwood	America	2,160	9,600	0.84 (green)
Pignut hickory	*Carya glabra*	hardwood	United States	2,140	9,500	0.75 (12% MC)
Sucupira	*Diplotropis purpurea*	hardwood	America	2,140	9,500	0.78 (green)
Karri	*Eucalyptus diversicolor*	hardwood	Asia–Oceania	2,040	9,100	0.82 (green)
Wallaba	*Eperua spp.*	hardwood	America	2,040	9,100	0.78 (green)
Mockernut hickory	*Carya tomentosa*	hardwood	United States	1,970	8,800	0.72 (12% MC)
Degame	*Calycophyllum candidissimum*	hardwood	America	1,940	8,600	0.67 (green)
Jarrah	*Eucalyptus marginata*	hardwood	Asia–Oceania	1,910	8,500	0.67 (green)
Shagbark hickory	*Carya ovata*	hardwood	United States	1,880	8,400	0.72 (12% MC)
Purpleheart	*Peltogyne spp.*	hardwood	America	1,860	8,300	0.67 (green)
Pecan	*Carya illinoensis*	hardwood	United States	1,820	8,100	0.66 (12% MC)
Shellbark hickory	*Carya laciniosa*	hardwood	United States	1,810	8,100	0.69 (12% MC)
Shorea	*Shorea spp., bullau group*	hardwood	Asia–Oceania	1,780	7,900	0.68 (green)
Angelin	*Andira inermis*	hardwood	Africa	1,750	7,800	0.65 (green)
Benge	*Guibourtia arnoldiana*	hardwood	Africa	1,750	7,800	0.65 (green)
Peroba rosa	*Aspidosperma spp., peroba group*	hardwood	America	1,730	7,700	0.66 (green)
Para-angelim	*Hymenolobium excelsum*	hardwood	America	1,720	7,700	0.63 (green)
Piquia	*Caryocar spp.*	hardwood	America	1,720	7,700	0.72 (green)
Kempas	*Koompassia malaccensis*	hardwood	Asia–Oceania	1,710	7,600	0.71 (green)
Black locust	*Robinia pseudoacacia*	hardwood	United States	1,700	7,600	0.69 (12% MC)

Pilon	*Hyeronima spp.*	hardwood	America	1,700	7,600	0.65 (green)
Opepe	*Nauclea diderrichii*	hardwood	Africa	1,630	7,300	0.63 (green)
Swamp white oak	*Quercus bicolor*	hardwood	United States	1,620	7,200	0.72 (12% MC)
Peroba de campos	*Paratecoma peroba*	hardwood	America	1,600	7,100	0.62 (green)
Honeylocust	*Gleditsia triacanthos*	hardwood	United States	1,580	7,000	0.6 (green)
Afrormosia	*Pericopsis elata*	hardwood	Africa	1,560	6,900	0.61 (green)
Pin oak	*Quercus palustris*	hardwood	United States	1,510	6,700	0.63 (12% MC)
Sapele	*Entandrophragma cylindricum*	hardwood	Africa	1,510	6,700	0.55 (green)
Cherrybark oak	*Quercus falcata var. pagodaefolia*	hardwood	United States	1,480	6,600	0.68 (12% MC)
Sweet birch	*Betula lenta*	hardwood	United States	1,470	6,500	0.65 (12% MC)
Willow oak	*Quercus phellos*	hardwood	United States	1,460	6,500	0.69 (12% MC)
Hard maple (sugar maple)	*Acer saccharum*	hardwood	United States	1,450	6,400	0.63 (12% MC)
Sepetir	*Pseudosindora palustris*	hardwood	Asia–Oceania	1,410	6,300	0.56 (green)
Scarlet oak	*Quercus coccinea*	hardwood	United States	1,400	6,200	0.67 (12% MC)
Bur oak	*Quercus macrocarpa*	hardwood	United States	1,370	6,100	0.64 (12% MC)
Post oak	*Quercus stellata*	hardwood	United States	1,360	6,000	0.67 (12% MC)
White oak	*Quercus alba*	hardwood	United States	1,360	6,000	0.68 (12% MC)
Ash (white ash)	*Fraxinus americana*	hardwood	United States	1,320	5,900	0.6 (12% MC)
Rock elm	*Ulmus thomasii*	hardwood	United States	1,320		0.63 (12% MC)
Beech (American beech)	*Fagus grandifolia*	hardwood	United States	1,300	5,800	0.64 (12% MC)
Ramin	*Gonystylus bancanus*	hardwood	Asia–Oceania	1,300	5,800	0.52 (green)
Red oak (northern red oak)	*Quercus rubra*	hardwood	United States	1,290	5,700	0.63 (12% MC)
Angelique	*Dicorynia guianensis*	hardwood	America	1,290	5,700	0.6 (green)
Mersawa	*Anisoptera spp.*	hardwood	Asia–Oceania	1,290	5,700	0.52 (green)
Keruing	*Dipterocarpus spp.*	hardwood	Asia–Oceania	1,270	5,600	0.69 (green)
Birch (yellow birch)	*Betula alleghaniensis*	hardwood	United States	1,260	5,600	0.62 (12% MC)
Iroko	*Chlorophora spp.*	hardwood	Africa	1,260	5,600	0.54 (green)
Swamp chestnut oak	*Quercus michauxii*	hardwood	United States	1,240	5,500	0.67 (12% MC)
Caribbean pine	*Pinus caribaea*	softwood	America	1,240	5,500	0.68 (green)
Kapur	*Dryobalanops spp.*	hardwood	Asia–Oceania	1,230	5,500	0.64 (green)
Black oak	*Quercus velutina*	hardwood	United States	1,210	5,400	0.61 (12% MC)
Laurel oak	*Quercus laurifolia*	hardwood	United States	1,210	5,400	0.63 (12% MC)
Green ash	*Fraxinus pennsylvanica*	hardwood	United States	1,200	5,300	0.56 (12% MC)
Water oak	*Quercus nigra*	hardwood	United States	1,190	5,300	0.63 (12% MC)
Overcup oak	*Quercus lyrata*	hardwood	United States	1,190	5,300	0.63 (12% MC)
Black maple	*Acer nigrum*	hardwood	United States	1,180	5,200	0.57 (12% MC)
Oregon ash	*Fraxinus latifolia*	hardwood	United States	1,160	5,200	0.55 (12% MC)
Santa Maria	*Calophyllum brasiliense*	hardwood	America	1,150	5,100	0.52 (green)
Chestnut oak	*Quercus montana*	hardwood	United States	1,130	5,000	0.66 (12% MC)
Andiroba	*Carapa guianensis*	hardwood	America	1,130	5,000	0.54 (green)
Manni	*Symphonia globulifera*	hardwood	America	1,120	5,000	0.58 (green)
Avodire	*Turraeanthus africanus*	hardwood	Africa	1,080	4,800	0.48 (green)

Southern red oak	*Quercus falcata*	hardwood	United States	1,060	4,700	0.59 (12% MC)
Southern magnolia	*Magnolia grandiflora*	hardwood	United States	1,020	4,500	0.5 (12% MC)
Albarco	*Cariniana spp.*	hardwood	America	1,020	4,500	0.48 (green)
Black walnut	*Juglans nigra*	hardwood	United States	1,010	4,500	0.55 (12% MC)
Teak	*Tectona grandis*	hardwood	Asia–Oceania	1,000	4,400	0.55 (green)
Roble (Tabebuia, roble group)	*Tabebuia spp., roble group*	hardwood	America	960	4,300	0.52 (green)
Cherry (black cherry)	*Prunus serotina*	hardwood	United States	950	4,200	0.5 (12% MC)
Soft maple (red maple)	*Acer rubrum*	hardwood	United States	950	4,200	0.54 (12% MC)
Paper birch	*Betula papyrifera*	hardwood	United States	910	4,000	0.55 (12% MC)
Ocote pine	*Pinus oocarpa*	softwood	America	910	4,000	0.55 (green)
Sande	*Brosimum spp., utile group*	hardwood	America	900	4,000	0.49 (green)
Hackberry	*Celtis occidentalis*	hardwood	United States	880	3,900	0.53 (12% MC)
Water tupelo	*Nyssa aquatica*	hardwood	United States	880	3,900	0.5 (12% MC)
Southern yellow pine (longleaf pine)	*Pinus palustris*	softwood	United States	870	3,900	0.59 (12% MC)
Slippery elm	*Ulmus rubra*	hardwood	United States	860	3,800	0.53 (12% MC)
Black ash	*Fraxinus nigra*	hardwood	United States	850	3,800	0.49 (12% MC)
Bigleaf maple	*Acer macrophyllum*	hardwood	United States	850	3,800	0.48 (12% MC)
Sweetgum	*Liquidambar styraciflua*	hardwood	United States	850	3,800	0.52 (12% MC)
Elm (American elm)	*Ulmus americana*	hardwood	United States	830	3,700	0.5 (12% MC)
Larch (western larch)	*Larix occidentalis*	softwood	United States	830	3,700	0.52 (12% MC)
African mahogany (Khaya)	*Khaya spp.*	hardwood	Africa	830	3,700	0.42 (green)
Black tupelo	*Nyssa sylvatica*	hardwood	United States	810	3,600	0.5 (12% MC)
Mahogany (genuine, Swietenia)	*Swietenia macrophylla*	hardwood	America	800	3,600	0.45 (green)
Parana-pine	*Araucaria augustifolia*	softwood	America	780	3,500	0.46 (green)
Dark red meranti		hardwood	Asia–Oceania	780	3,500	0.46 (green)
Sycamore (American sycamore)	*Platanus occidentalis*	hardwood	United States	770	3,400	0.49 (12% MC)
Yellow meranti	*Shorea spp.*	hardwood	Asia–Oceania	770	3,400	0.46 (green)
Radiata pine	*Pinus radiata*	softwood	Asia–Oceania	750	3,300	0.42 (green)
Virginia pine	*Pinus virginiana*	softwood	United States	740	3,300	0.48 (12% MC)
Douglas-fir	*Pseudotsuga menziesii*	softwood	United States	710	3,200	0.48 (12% MC)
Cucumbertree magnolia	*Magnolia acuminata*	hardwood	United States	700	3,100	0.48 (12% MC)
Silver maple	*Acer saccharinum*	hardwood	United States	700	3,100	0.47 (12% MC)
Loblolly pine	*Pinus taeda*	softwood	United States	690	3,100	0.51 (12% MC)
Shortleaf pine	*Pinus echinata*	softwood	United States	690	3,100	0.51 (12% MC)
Mountain hemlock	*Tsuga mertensiana*	softwood	United States	680	3,000	0.45 (12% MC)
Douglas-fir (Interior West)	*Pseudotsuga menziesii*	softwood	United States	660	2,900	0.5 (12% MC)
Spruce pine	*Pinus glabra*	softwood	United States	660	2,900	0.44 (12% MC)
Determa	*Ocotea rubra*	hardwood	America	660	2,900	0.52 (green)
Primavera	*Tabebuia donnell–smithii*	hardwood	America	660	2,900	0.4 (green)
Port-Orford-cedar	*Chamaecyparis lawsoniana*	softwood	United States	630	2,800	0.43 (12% MC)
Cativo	*Prioria copaifera*	hardwood	America	630	2,800	0.4 (green)
Ilomba	*Pycnanthus angolensis*	hardwood	Africa	610	2,700	0.4 (green)

Douglas-fir (Interior North)	*Pseudotsuga menziesii*	softwood	United States	600	2,700	0.48 (12% MC)
Spanish cedar	*Cedrela spp.*	hardwood	America	600	2,700	0.41 (green)
Alder (red alder)	*Alnus rubra*	hardwood	United States	590	2,600	0.41 (12% MC)
Tamarack	*Larix laricina*	softwood	United States	590	2,600	0.53 (12% MC)
Yellow-cedar	*Chamaecyparis nootkatensis*	softwood	United States	580	2,600	0.44 (12% MC)
Jack pine	*Pinus banksiana*	softwood	United States	570	2,500	0.43 (12% MC)
Red pine	*Pinus resinosa*	softwood	United States	560	2,500	0.46 (12% MC)
Hura	*Hura crepitans*	hardwood	America	550	2,400	0.38 (green)
Chestnut (American chestnut)	*Castanea dentata*	hardwood	United States	540	2,400	0.43 (12% MC)
Poplar (yellow-poplar)	*Liriodendron tulipifera*	hardwood	United States	540	2,400	0.42 (12% MC)
Western hemlock	*Tsuga heterophylla*	softwood	United States	540	2,400	0.45 (12% MC)
Black spruce	*Picea mariana*	softwood	United States	530	2,400	0.42 (12% MC)
Red spruce	*Picea rubens*	softwood	United States	530	2,200	0.4 (12% MC)
Cypress (baldcypress)	*Taxodium distichum*	softwood	United States	510	2,300	0.46 (12% MC)
Douglas-fir (Interior South)	*Pseudotsuga menziesii*	softwood	United States	510	2,300	0.46 (12% MC)
Spruce (Sitka spruce)	*Picea sitchensis*	softwood	United States	510	2,300	0.4 (12% MC)
Banak	*Virola spp.*	hardwood	America	510	2,300	0.42 (green)
California red fir	*Abies magnifica*	softwood	United States	500	2,200	0.38 (12% MC)
Eastern hemlock	*Tsuga canadensis*	softwood	United States	500	2,200	0.4 (12% MC)
Butternut	*Juglans cinerea*	hardwood	United States	490	2,200	0.38 (12% MC)
Grand fir	*Abies grandis*	softwood	United States	490	2,200	0.37 (12% MC)
Limba	*Terminalia superba*	hardwood	Africa	490	2,200	0.38 (green)
White fir	*Abies concolor*	softwood	United States	480	2,100	0.39 (12% MC)
Lodgepole pine	*Pinus contorta*	softwood	United States	480	2,100	0.41 (12% MC)
Redwood (old-growth)	*Sequoia sempervirens*	softwood	United States	480	2,100	0.4 (12% MC)
Incense-cedar	*Calocedrus decurrens*	softwood	United States	470	2,100	0.37 (12% MC)
Ponderosa pine	*Pinus ponderosa*	softwood	United States	460	2,000	0.4 (12% MC)
Mexican cypress	*Cupressus lustianica*	softwood	Africa	460	2,000	0.39 (green)
Light red meranti		hardwood	Asia–Oceania	460	2,000	0.34 (green)
Cottonwood (eastern cottonwood)	*Populus deltoides*	hardwood	United States	430	1,900	0.4 (12% MC)
Pacific silver fir	*Abies amabilis*	softwood	United States	430	1,900	0.43 (12% MC)
Obeche	*Triplochiton scleroxylon*	hardwood	Africa	430	1,900	0.3 (green)
Western white pine	*Pinus monticola*	softwood	United States	420	1,900	0.38 (12% MC)
Redwood (young-growth)	*Sequoia sempervirens*	softwood	United States	420	1,900	0.35 (12% MC)
Basswood	*Tilia americana*	hardwood	United States	410	1,800	0.37 (12% MC)
Noble fir	*Abies procera*	softwood	United States	410	1,800	0.39 (12% MC)
White spruce	*Picea glauca*	softwood	United States	410	1,800	0.36 (12% MC)
Engelmann spruce	*Picea engelmannii*	softwood	United States	390	1,750	0.35 (12% MC)
Balsam fir	*Abies balsamea*	softwood	United States	380	1,700	0.35 (12% MC)
Eastern white pine	*Pinus strobus*	softwood	United States	380	1,700	0.35 (12% MC)
Sugar pine	*Pinus lambertiana*	softwood	United States	380	1,700	0.36 (12% MC)
Cuangare	*Dialyanthera spp.*	hardwood	America	380	1,700	0.31 (green)

Okoume	*Aucoumea klaineana*	hardwood	Africa	380	1,700	0.33 (green)
Aspen (quaking aspen)	*Populus tremuloides*	hardwood	United States	350	1,600	0.38 (12% MC)
Black cottonwood	*Populus trichocarpa*	hardwood	United States	350	1,600	0.35 (12% MC)
Atlantic white-cedar	*Chamaecyparis thyoides*	softwood	United States	350	1,600	0.32 (12% MC)
Western red cedar	*Thuja plicata*	softwood	United States	350	1,600	0.32 (12% MC)
Subalpine fir	*Abies lasiocarpa*	softwood	United States	350	1,600	0.32 (12% MC)
Northern white-cedar	*Thuja occidentalis*	softwood	United States	320	1,400	0.31 (12% MC)
Ceiba	*Ceiba pentandra*	hardwood	America	240	1,100	0.25 (green)
Eastern red cedar	*Juniperus virginiana*	softwood	United States		4,000	0.47 (12% MC)

Measured at 15% moisture content

These 5 woods are printed at 15% moisture content, not at 12%. They are not ranked with the 12% values above.

NAME	BOTANICAL NAME	TYPE	ORIGIN	JANKA LBF	JANKA N	SG
Jelutong	*Dyera costulata*	hardwood	Asia–Oceania	390	1,700	0.36 (green)
Merbau	*Intsia spp.*	hardwood	Asia–Oceania	1,500	6,700	0.64 (green)
Pau marfim	*Balfourodendron riedelianum*	hardwood	America			0.73 (green)
Meranti (white meranti, lauan group)	*Shorea spp.*	hardwood	Asia–Oceania	1,140	5,100	0.55 (green)
Sucupira	*Bowdichia spp.*	hardwood	America			0.74 (green)