

WHITE SPRUCE & ENGELMANN SPRUCE

Botanical Names:

Picea glauca (Moench) Voss,
Picea engelmannii Parry ex Engelm.

WHITE SPRUCE

Within British Columbia, white spruce and its hybrids are found throughout the Interior from the east slope of the Coast Range eastwards throughout the rest of the province. White Spruce can be found in the south of the province, but it is much more prevalent in the northern regions where it often succeeds poplar and pine in many burned areas. It can reach up to 45 metres in height and 1 metre in diameter. While white spruce commonly forms pure stands within its geographical growing range, it also is a major component of mixed stands. Common associates to white spruce include: trembling aspen, white birch, balsam fir, tamarack, black spruce, jack pine, lodgepole pine and Douglas-fir.

ENGELMANN SPRUCE

Engelmann spruce occurs at high elevations and interbreeds with white spruce in areas where their ranges overlap, and they are referred to as Interior spruce.

The wood of these two spruce species cannot be differentiated visually. Engelmann spruce wood is slightly denser, harder and stronger than that of white spruce, but the differences are very minor.

All British Columbian species of spruce, including Sitka spruce, account for 22% of the province's total forest inventory and, of this, white spruce makes up the largest portion of the growing stock.

Common Uses

White spruce wood is highly valued for lumber, plywood and pulp production. As dimension lumber, white spruce is extremely versatile because of its high strength-to-weight ratio. It is used in building construction (framing, sheathing, roofing, sub-flooring), general millwork, interior finishing, boxes and packing cases. Its dimensional stability and superior gluing properties make it popular in the prefabrication industry. White spruce is used in the manufacture of modular houses, trusses, and other structural components that specify



WHITE SPRUCE



ENGELMANN SPRUCE

kiln-dried SPF wood. As a premier pulpwood, the species is used in the manufacture of newsprint and bleached Kraft pulps. It is also used in the manufacture of medium density fiberboard (MDF), paperboard and felt, and it is a major species used in Canadian softwood plywood. Other uses of white spruce include: sounding boards in musical instruments from select materials, food containers (because it is almost colourless and odourless when dried), paddles and oars, cooperage, organ pipes, shelving, and ladder rails.

Spruce lumber is dried according to end-use and customer specifications. Kiln drying inhibits natural staining of the wood, improves its strength and stiffness, enhances its appearance, and increases its resistance to decay and attack by insects.

PHYSICAL PROPERTIES		
DENSITY (kg/m ³)	Green	306
	Air Dry	390
SPECIFIC GRAVITY (12% M.C.)	Standard	0.36
HARDNESS (N)	Side	1880
	End	2470
MOE (Mpa)	Green	7930
	Air Dry	9930
MOR (Mpa)	Green	35.2
	Air Dry	62.7
COMPRESSION PARALLEL (Mpa)	Air Dry	36.9
COMPRESSION PERPENDICULAR (Mpa)	Air Dry	3.45
SHEAR (Mpa)	Air Dry	6.79
CLEAVAGE (N/mm Width)	Air Dry	38.7
SHRINKAGE OD = oven dry air = air dry 12%	Radial (OD)	3.2%
	Tangential (OD)	6.9%
	Volumetric (OD)	11.3%
	Volumetric (air)	6.8%
	Tang / Rad ratio	1.6

VISUAL PROPERTIES	
COLOUR	
Heartwood	Pale silvery-yellow to pale brownish-white, wood is satiny or lustrous.
Sapwood	Nearly white.
Heartwood / Sapwood Contrast	Sapwood is not usually distinguishable from heartwood.
Latewood / Earlywood Contrast	Growth rings are distinct, delineated by the contrast between the latewood and the earlywood of the succeeding ring. Earlywood zone is usually a number of times wider than the latewood zone and transition from earlywood to latewood is gradual.
GRAIN	
Usually straight-grained and fairly fine-textured.	
FIGURE	
Plainsawn lumber or rotary-cut veneer: Faint growth ring. Quartersawn lumber or quarter-sliced veneer: Very little.	
KNOTS	
Spruce lumber may have numerous small intergrown or encased pin knots.	
OTHER	
Wood has no distinctive odour or taste. White spruce is soft but firm, and moderately light in weight.	
Wood is resinous but hardly ever contains pitch pockets.	
The woods of white, black, red, and Engelmann spruces cannot be distinguished with certainty from one another on the basis of gross or minute characteristics.	



WORKING PROPERTIES

Spruce has a high strength-to-weight ratio and is well known for its working properties. The wood dries rapidly with small dimensional movement and little tendency to check. It is relatively easy to work, with good machining qualities. It turns, planes and shapes well and can be sanded to a smooth finish. The wood glues moderately easily, has moderate nail and screw holding ability, and takes a good finish.

PROCESS	PERFORMANCE	COMMENTS
MACHINING		
Planing	Easy. Good quality	Good planing quality. Typical defect is raised grain. Recommended planer settings: 12° or 20° hook angle and 20 kmpi (knife marks per inch).
Turning	Satisfactory	Satisfactory surface quality when using rotary-knife lathe and poor when using a single point lathe. Common defect: torn out grain.
Sawing	Good	Easily worked with hand and power tools. Slight to moderate blunting effect. While knots can sometimes be a problem, the wood can be sawn cleanly, with sharp cutting edges
Boring	Medium quality	Medium boring quality using brad point bits.
Mortising	Good	Very good mortising quality using both a hollow chisel and a chain mortise.
Shaping	Good	Good shaping quality. Common shaping defects in the order of frequency: splintering at the corner, rough end-grain, fuzzy grain, raised grain, and torn grain. Recommended: the use of a counter piece for end-grain shaping.
Veneering	N/A	
Sanding	Very good	
FASTENING		
Screwing	Satisfactory to good holding	Very good resistance to splitting. Average screw retention: 347 lb.
Nailing Retention	Satisfactory to good holding	Very good resistance to splitting.
Laternal Nail Holding	Moderate	
Gluing	Moderrately easy to glue	
FINISHING		
Staining	Good	Good staining properties. A smooth finish is achieved. A natural finish (clear coat) or a light stain looks the best.
Painting	Satisfactory	
Lacquering	Good	Good results. Performs very well in the tape test (i.e. small flakes of the coating were detached at intersections of cuts, less than 5% of the area affected) and well in the pull-off test (i.e. average strength of 31 kg/cm ²).
Waxing	Good	Easy and with good results. Best when using light-coloured waxes (e.g. Mellow Pine).
DRYING		
Ease of Drying	Easy to moderately easy	Spruce dries faster than pine and is not adversely affected by severe high-temperature schedules.
DURABILITY		
Natural Decay Resistance	Non-resistant to heartwood decay	
Treatability	Very resistant to impregnation with preservatives	



Commercial Availability

White spruce and Engelmann spruce are produced predominantly as SPF lumber in structural grades according to National Lumber Grades Authority (NLGA) rules for dimension lumber. Select Structural, #2 and better, and stud grades are the most common grades produced. Specialty in-house grades, lamstock and export grades are also available.

Appearance grades are also produced according to NLGA rules. Clears, shop lumber and moulding stock are most common, though there are many potential appearance grades that can be produced.

** Marketed as structural lumber in the SPF (spruce-pine-fir) species mix. SPF includes lodgepole pine, white spruce, Engelmann spruce, red spruce, black spruce, jack pine, balsam fir, and subalpine fir.*



Data for this factsheet has been compiled by Forintek Canada Corp. from internal and external scientific sources. Forintek is a not-for-profit technical research institute serving the Canadian forest sector.