INFORMATION SHEET

STRUCTURAL MATERIALS

NZ WOOD
For a better world

ROUNDWOOD
DESIGN

The information provided below has been taken from the New Zealand Timber Design Guide 2007, published by the Timber Industry Federation and edited by Professor A H Buchanan. To purchase a copy of the Timber Design Guide, visit www.nztif.co.nz

POLE PROPERTIES

All standard poles are machine-peeled to remove the bark, nodal swellings and uneven surfaces, while maintaining the natural taper. As a special order for large sizes, poles may be debarked manually using sharp spades and scraping tools. After peeling, poles can be machine-shaved tapering to a smooth even shape, from 60mm to 200mm diameter and length up to 12 metres or more. (Larger diameters are commonly available from some pole suppliers but may vary in length) If larger poles are required, special machinery can be used to shave poles up to 400mm diameter and up to 10 metres long (check with your pole suppliers). Fence posts are sometimes cut in half or quartered along their length. Uniform poles can also be cut in half with special machinery, but this is not recommended for construction as the heartwood is exposed and difficult to treat

The distinction between machine peeled and machine shaved is that peeling removes the bark and some of the nodal swelling while shaving removes the nodal swelling as well.

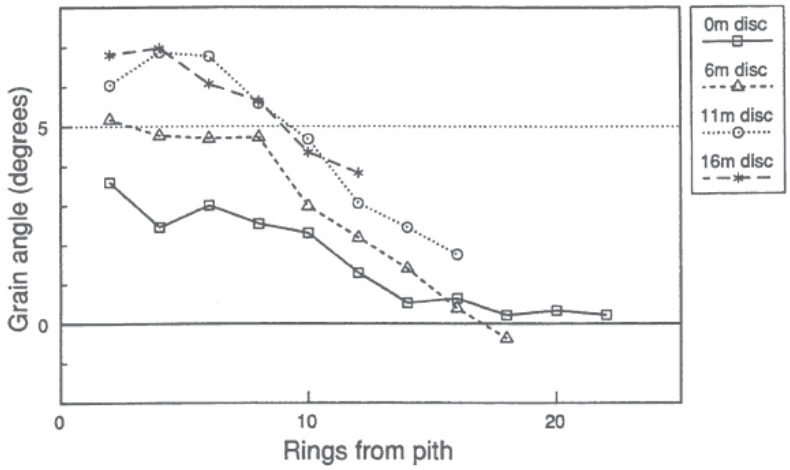
SPECIAL ASPECTS TO USING ROUNDWOOD

Spiral grain

Spiral grain is a natural feature of timber. Radiata pine, like most other species of pine, grows with a left hand spiral grain direction in each growth ring that increases up to about 6 degrees in the 5th growth ring, then decreases to nil at the 15th to 20th growth ring. After that it usually becomes a right hand spiral1. This pattern is shown in diagram 1.

Spiral grain can cause rotation of one end of the pole with respect to the other as the pole dries. This can be a problem in transmission lines in prolonged dry weather because the cross arms at the top of the pole may rotate. If this is likely to have serious consequences, then poles should be chosen to have straight grain, and be conditioned to their expected equilibrium moisture content before erection. In a pole with 15 or more growth rings, twisting caused by spiral grain does not usually occur because the outer fibres tend to counteract the twisting force generated by the inner fibres.

Diagram 1: Variation of spiral grain with height and number of growth rings from the pith



Nodal swellings

The nodal swellings reinforce the pole considerably. Reduction factors are available for design of poles where nodal swellings have been removed by peeling or shaving, as is normally the case. Peeling is a process whereby the bark is rubbed off whereas shaving is a process where the bark is cut off along with wood at nodal swellings. The amount of wood removed by shaving is greater than in peeling and therefore the reduction in strength is greater for shaved poles than for peeled poles. The reinforcement in unpeeled poles is such that the number and size of knots is irrelevant, but in peeled and shaved poles, the number and size of the knots becomes important and these are limited by grading rules.

Surface checking

Longitudinal surface checks inevitably develop in poles as they dry because wood shrinks more in the tangential direction than in the radial direction. The checks tend to develop on the side of the pole exposed to the sun because the drying stresses are greater there than on the shaded side. Checks generally have no effect on strength properties with the possible exception of shear strength. They may also develop where holes have been drilled to attach other members. A practice that is common in Japan is to make a longitudinal saw cut to a depth of 50 to 100 mm before the pole starts to dry, as shown in diagram 1. This cut, called a kerf, will open and so relieve the drying stresses in the rest of the pole, reducing the occurrence of checks and improving the pole's appearance.