Lumber & Grades

Logs are generally sound, with no decay, heartshake, or insect attack. The wood saws easily, and high lumber recovery can be achieved, dependent primarily on saw pattern, log diameter and shape.

Freshly sawn lumber is prone to bluestain and should be treated with a stain control chemical directly after sawing, unless immediate kiln drying is intended. This is very important in warm and humid climates.

Sawn lumber dries easily and can be kiln dried rapidly from green. The wood can be readily treated with preservative to comply with all durability levels.

Lumber Grades

Through good silvicultural management, New Zealand pine logs come in a range of qualities capable of yielding lumber grades to meet almost any requirement.

Appearance grades (board grades): for finishing and furniture uses can be either clear of knots or contain minor blemishes and tight knots.
They include:

- **Clear lumber** free of knots and blemishes, used for high quality joinery, furniture and mouldings.

New Zealand pine is a light coloured, medium density softwood with a moderately even texture that produces sawn lumber with excellent working properties.

Lumber & Grades

Visual grading of random width lumber

Cuttings grades for reprocessing to produce shorter clear lengths with excellent machining, and gluing properties. These grades contain large knots and blemishes which are removed by cross-cutting and ripping. The resulting clear components are often finger-jointed and edge-glued to produce mouldings and furniture.

Structural grades (framing grades): used primarily for construction where strength and stiffness are important. The main factor influencing a structural grade is the size and location of knots. Grades limit such defects to meet specified strength requirements.

Industrial grades: used in packaging for various products such as pallets, cable drums, and concrete formwork. Grades contain a range of knot sizes compatible with the final use.

New Zealand exporters are able to grade to most customer requirements, however, common export grades include:

Australia – Standards Association of Australia F5 and F7 structural grades (visual and machine stress graded)

United States – Western Wood Products Association random width lumber specifications including mouldings and better, shop and factory grades.

Japan – JAS structural grade specifications (which also include glue-laminated and plywood grades). Industrial grades are also produced including thinboard and a range of other grades to buyer specifications.

Grading Methods

There are two commonly used grading methods available in New Zealand.

Visual grading: where the incidence of visible characteristics is visually assessed by a trained grader. This method is used for appearance, structural and industrial grades and is the most commonly used.

Characteristics present in New Zealand pine and which may be specified in visual grades, include: knots, bark and resin pockets, resin streaks, pith and associated juvenile wood zone, needle fleck (birds eye), grain deviation and bluestain.

Knots are the major characteristic encountered in New Zealand pine which affect quality and grade. The type, position, and condition of knots permitted varies considerably between grades. In long-length appearance grades, encased knots (surrounded by bark) are more severely limited than intergrown ones. In strength grades, the type of knot is largely irrelevant. It is the size and position of the knot or group of knots (coupled with wood density) that influences strength through the combined effect of the knot and associated grain deviation.

Machine stress grading: where the lumber is passed through a machine which measures its bending stiffness and assigns a grade on the basis of predetermined relationships between strength and stiffness. This method is used for structural grades, is more precise than visual grading, and therefore very reliable.

New Zealand pine may be graded to any grading rules, but those which recognise its particular characteristics are generally the most effective. Rules which recognise the juvenile and outerwood properties of New Zealand pine, and the improvement in structural properties that occur as distance from the centre of the log increases, are more effective than rules which make distinctions on the basis of growth rate as measured by ring width.

Most countries group species according to their structural properties and assign the same design values to all species in the

group. In Australia, New Zealand pine (known in Australia and some other countries as radiata pine) is grouped with western hemlock, cypress pine, red meranti, loblolly pine, maritime pine and Australian grown Douglas-fir. In Japan, New Zealand pine is grouped with merkuzii pine and those species in the spruce-pine-fir (SPF) classification used in the United States and Canada. In Britain, the strength class assigned to New Zealand pine are closest to those assigned to British grown Corsican pine, Canadian SPF, European redwood/whitewood, and Scots pine.

For decorative uses, New Zealand pine compares well in North America with ponderosa and yellow pines for the moulding and millwork markets.

GRADE RECOVERIES

Grades of lumber that can be recovered from New Zealand pine logs are strongly influenced by the log quality. Variables which have most effect are: log diameter, sweep, internode length, branch size, knotty core size (in pruned logs), and wood density.

Branch size and spacing have an important effect on the recovery of visually graded lumber. As the branch size and/or number of branch whorls increases, the recovery of better grades decreases.

For machine stress grading the most important factors affecting recovery are density and increased branch size.

It is useful to include a restriction on juvenile wood – ie approximately 10 growth rings from the pith (the growth centre of the log) in higher structural grades. This specific provision recognises that ring width limitations applied to other species are not appropriate to New Zealand pine. Limitations on knots and juvenile wood control 60% of the variation in lumber strength. The remaining variation is controlled by factors such as density and slope of grain, which are difficult to assess visually.

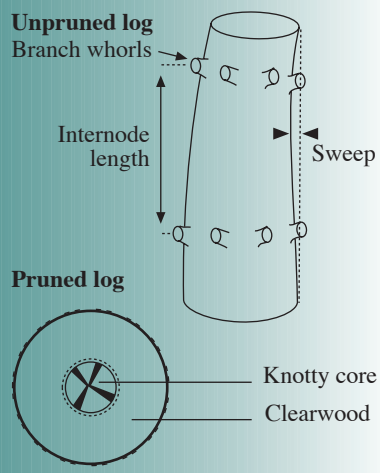
Machine stress grading, which measures stiffness, directly eliminates any concerns about ring width and low density juvenile wood.

MECHANICAL PROPERTIES

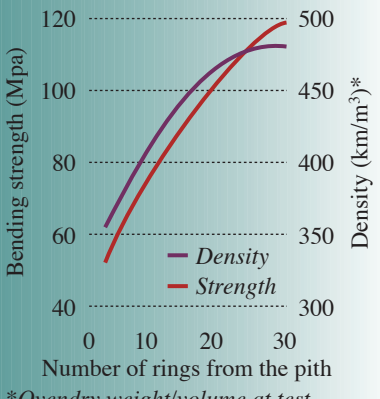
The mechanical properties of sawn lumber are closely related to knot size and density. Because density increases with increasing distance from the centre of the log, mechanical properties also increase. Ring width generally decreases as distance from the centre of the log increases. Thus, mechanical properties increase as ring width decreases but the effect is primarily due to density. Studies in Japan have shown that wood from forests which have been thinned some time before harvesting can have wide growth rings but good strength and stiffness.

In graded lumber, a ring width limitation has very little effect on the weaker pieces which govern design strength. Studies on structural grades in New Zealand based on lumber graded to Japanese grading rules have shown that if the maximum ring width permitted in the grade is reduced from 20 mm to 6 mm, the recovery of 100x50 mm lumber drops by 50% while the design strength increases by only 10% .

LOG VARIABLES



EFFECT OF DENSITY FROM THE PITH



*Ovendry weight/volume at test

STIFFNESS & RING WIDTH VARIATION FROM PITH TO BARK