Plywood & LVL

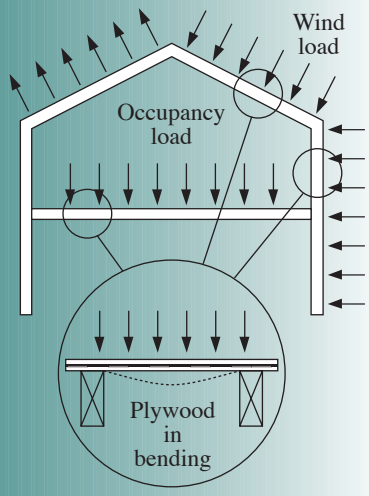
Plywood properties can be optimised by using veneer grades and the distribution of density within the tree. Japanese research has shown New Zealand pine to be a favourable species for LVL.

Manufacture

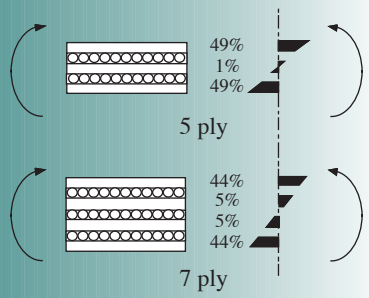
Within a single growth ring, New Zealand pine is uniform in density. The soft spring wood is more than half the density of the summer wood, whereas in Douglas fir, the density of the spring wood is only one-third that of the summer wood. This means that New Zealand pine is easier to peel than some other species.

Veneer should be dried to an average 5% moisture content before gluing.

Typical Loads On Plywood In Buildings



Load Carried By Outer Veeners Of Plywood In Bending



The gluing process needs careful control in the factory, according to site conditions and the type of adhesive. Daily records are necessary to identify changes in wood quality and climate in the factory for each product type. Plywood in New Zealand is manufactured to the joint Australian/New Zealand standard AS/NZS 2269.

Peeler Logs

New Zealand pine has a low-density core zone in the centre of the log. This zone has a tendency to distort on drying. From about ring 10, the wood is of much higher density.

Comparison Of Strength Properties

Clearwood specimens, 2" (ASTM) basis

Species	Specific gravity	Modulus of rupture (kg/cm²)	Modulus of elasticity (kg/cm²)	Compression strength (kg/cm²)	Shear strength (kg/cm²)
Englemann spruce	0.35	650	91,000	310	85
Siberian larch	0.48	950	128,000	500	100
Douglas fir (coast)	0.48	870	137,000	520	80
Douglas fir (interior north)	0.48	920	125,000	490	99
Douglas fir (interior south)	0.46	840	105,000	440	106
Lauan	–	800	114,000	410	86
New Zealand pine (low-density sites)	0.43	870	101,000	380	102
New Zealand pine (med-density sites)	0.46	930	108,000	400	107
New Zealand pine (high-density sites)	0.50	1,000	117,000	440	115

Properties of New Zealand pine compare well with other species. It has excellent strength and can be used to make plywood to meet required national standards.

In plywood manufacture, the central peeler core may be diverted to other uses. The density of the wood available for peeling is, therefore, better than the log average. When peeler lathes cut down to small cores, the veneer from the low-quality core should be sorted out and used only in the inner plies of the panel. Veneer from the outerwood is of higher density and strength.

Older trees have greater quantities of higher-density, higher-strength outerwood. A typical pruned log in the age range of current production has a knotty core of 18-26 cm, and diameters range from 35-75 cm at age 30.

Typical recoveries of dry veneer are 60-65% of underbark log volume. The quantity of different grades varies according to log diameter and for unpruned logs it also depends on the branch sizes. With improved mill efficiencies and better sites, pruned logs may yield 15-50% clear veneer and 30-60% useable knotty grades.

Unpruned logs also yield good quantities of useable veneer. The smaller the branch size, the better will be the veneer recovered. Stand and mill surveys should be carried out to determine likely recoveries.

Strength Of Wood

The clearwood strength of New Zealand pine compares well with other species traditionally used for making plywood. In many uses, plywood supports its load through its resistance to bending.

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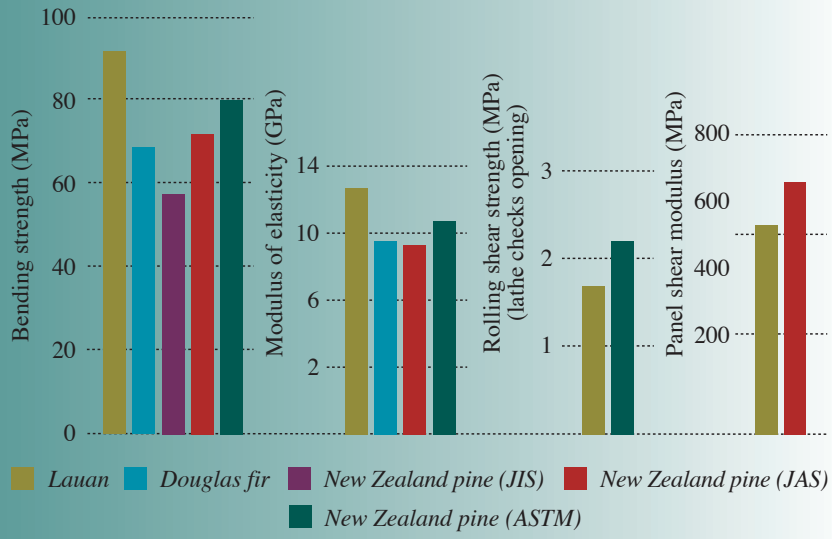
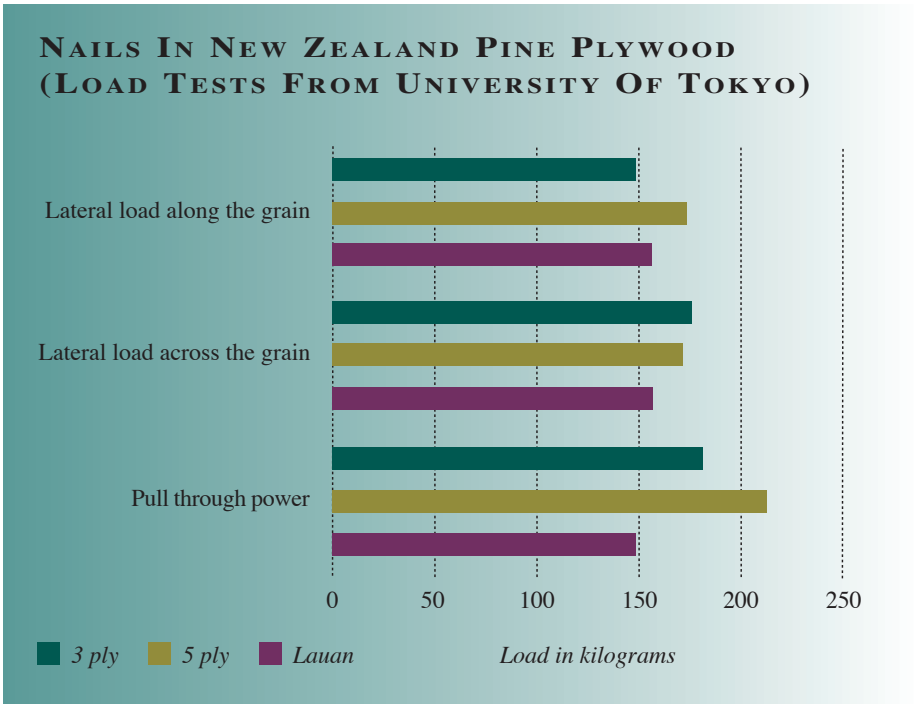
Comparison Of Plywood Properties Tested To JIS, JAS And ASTM Test Methods



Plywood & LVL



Higher density New Zealand pine has a density and stiffness close to Douglas fir. For bracing and plywood web-beams, shear properties are important.

Different densities have different values for strength (modulus of rupture) and stiffness (modulus of elasticity). New Zealand pine should be selected for density if these properties are important. For many uses, high strength is not essential and lower density can be used.

Plywood Standards

New Zealand pine has been accepted provisionally as a Group 2 species for use with US Product Standard PS1-83. With careful selection and grading, higher classification is possible. For Japan, plywood made from different densities of New Zealand pine will have a modulus of elasticity values range as shown in the test figures. Each bar shows the range of stiffness values expected for 90% of the production from high, medium and low density forests. Plywood made with New Zealand pine veneer from high or medium-density forests should have no problem meeting the requirements of JAS 1516.

Plywood Strength

The bending strength of plywood is determined almost entirely by the veneers parallel to the span that are most distant from the neutral axis. These outer veneers carry almost all the load. This means that they determine the performance.

Faces and backs should be of high grades, such as clear high-density New Zealand pine or hardwood species. The inner veneers can be of much lower quality. But if high properties perpendicular to the face grain are desired, the first cross bands should also be of high quality.

Stability

The thickness and quality of the outer veneers are important for panel stability. If distortion-prone wood is used in a lower-quality core, internal stresses can be set up by moisture movement. These stresses will distort the panel unless the face and back veneers are thick enough and of sufficient quality to resist the stresses. Thinner face veneers can lead to distortion problems but thicker, higher-quality, outer veneers can help to increase the recovery of lower-quality veneer for use in the core.

Utilisation

New Zealand pine plywood is very easy to saw, shape and fabricate into a full range of structural components. Professor Motoaki Okuma of University of Tokyo has tested New Zealand pine, Lauan and Douglas fir plywood. New Zealand pine was found to have bending properties similar to the other species, but it had better shear properties.

It is easy to nail and has good nail-holding power compared with Lauan plywood.

Shear strength of plywood is important in beams of for bracing to resist winds or earthquakes. Knotty veneer has better shear strength than clear veneer and can be used in the core of panels.

Laminated Veneer Lumber (LVL)

LVL has been manufactured from New Zealand pine since 1991 by a Japanese company at a number of factory sites.

Tests on LVL of many species at the Forestry and Forest Products Research Institute at Tsukuba have shown that New Zealand pine is very suitable for laminated veneer lumber.

In compression, New Zealand pine LVL had superior performance and New Zealand pine nail plate joints gave the highest load resistance.