PRESERVATIVE TREATMENT OF NEW ZEALAND RADIATA PINE

In New Zealand, development of wood preservative treatment has contributed greatly to utilisation of New Zealand radiata pine and its acceptability for a wide range of uses where long-term durability is essential.

Unlike many traditional softwoods of commerce such as spruce, hemlock, and Douglas fir (oregon), the sapwood of New Zealand radiata pine is exceedingly permeable to wood preservative solutions, particularly in the radial direction (Fig. 8). Thus, in roundwood complete penetration of the sapwood is always achievable. The heartwood of New Zealand radiata pine is much more variable; some is as permeable as sapwood, but a significant proportion is much less so.

New Zealand radiata pine has been found suitable for treatment by all conventional wood preservation processes; typical treatment schedules used in New Zealand are given in Table 12. It is not necessary to incise large dimension lumber or roundwood to achieve deep penetration of preservative solutions.

Several processes have been developed in New Zealand to take advantage of the excellent treatability characteristics of New Zealand radiata pine. These include:

(1) Boron diffusion treatment, whereby freshly sawn lumber is momentarily immersed in concentrated solutions of boron salts and then block-stacked under cover to allow complete diffusion of the salts into the centre of each piece of lumber. Such treatment is used for protection against borer attack of framing lumber and other stock which will not be exposed to the weather in service.

(2) Low-pressure Lowry and Rueping processes for Light Organic Solvent Preservatives to achieve deep preservative penetration with a minimum of solution usage.

TABLE 12–*Typical preservative treatment schedules for New Zealand radiata pine to achieve 100% sapwood penetration and satisfactory heartwood penetration*

Process	Preservative type	Initial vacuum (kPa)	Initial vacuum (bar)	Initial air pressure (kPa)	Initial air pressure (bar)	Time (min)	Treating pressure (kPa)	Treating pressure (bar)	Time (min)	Final vacuum (kPa)	Final vacuum (bar)	Time (min)
Bethell (full cell)	Water-borne	–85	–0.83	–	–	15	1400	13.8	90	–85	–0.83	10
Lowry (empty cell)	Water-borne	0.0	0.0	–	–	–	1400	13.8	90	–85	–0.83	45
APM * (empty cell) (modulated pressure)	Water-borne	0.0	0.0	–	–	–	1400/0 (15 cycles)	13.8/0	90	–85	–0.83	10
Rueping (empty cell)	Oil-borne	0.0	0.0	400	5.9	30	1400	13.8	300	–85	–0.83	30
Short Bethell†	LOSP	–35	–0.33	–	–	10	35	0.35	>10	–85	–0.83	45
Short Lowry†	LOSP	0.0	0.0	–	–	–	70	0.69	>10	–85	–0.83	45
Short Rueping†	LOSP	–	–	35	0.35	10	105	1.0	>10	–85	–0.83	45

* Alternating Pressure Method for treatment of pre-steamed / partially seasoned roundwood and lumber.
† Modified standard schedules for treatment with Light Organic Solvent Preservatives

(3) Pre-steaming / partial seasoning schedules whereby freshly felled and peeled roundwood or sawn lumber is conditioned for treatment by conventional processes (e.g., Bethell) or by the Alternating Pressure Method. Steam conditioning has also been found beneficial for improving heartwood treatment in sawn lumber.

Specifications for wood preservative treatments for local conditions are issued by an industry-nominated New Zealand Timber Preservation Council and are based on mandatory regulations previously issued by the Government-appointed Timber Preservation Authority.

Principal wood preservatives used for New Zealand radiata pine are:

1. *Boron salts*: Hazard Class H1 (Table 13); retention 3.2 kg boric acid/m³.

2. *Copper chrome arsenate*: all Hazard Classes; retentions 2.8–3.0 kg/m³ (H1), 5.0–6.1 kg/m³ (H3), 9.4–12.0 kg/m³ (H4), 12.4–16.7 kg/m³ (H5), 24.0–31.0 kg/m³ (H6), precise retentions depending on preservative formulation.

3. *Light organic solvent preservatives* based on organo-copper or organo-tin: Hazard Class H3; retentions vary with formulation.

Creosote and pentachlorophenol + fuel oil are occasionally used for the treatment of railway sleepers for the New Zealand Railways Corporation.

Preservative retentions and depths of penetration required are generally higher than used in other countries, particularly where unit value is high or in critical-use situations. They were developed to confer a minimum service life of 30 years for any treated commodity although experience has indicated that a more realistic minimum, particularly in ground contact situations (Hazard Classes H4 and H5), is 40–50 years.

FIG. 8–*Comparative treatability of some commercial softwoods — preservative penetration in the radial direction in experimental blocks of sapwood*

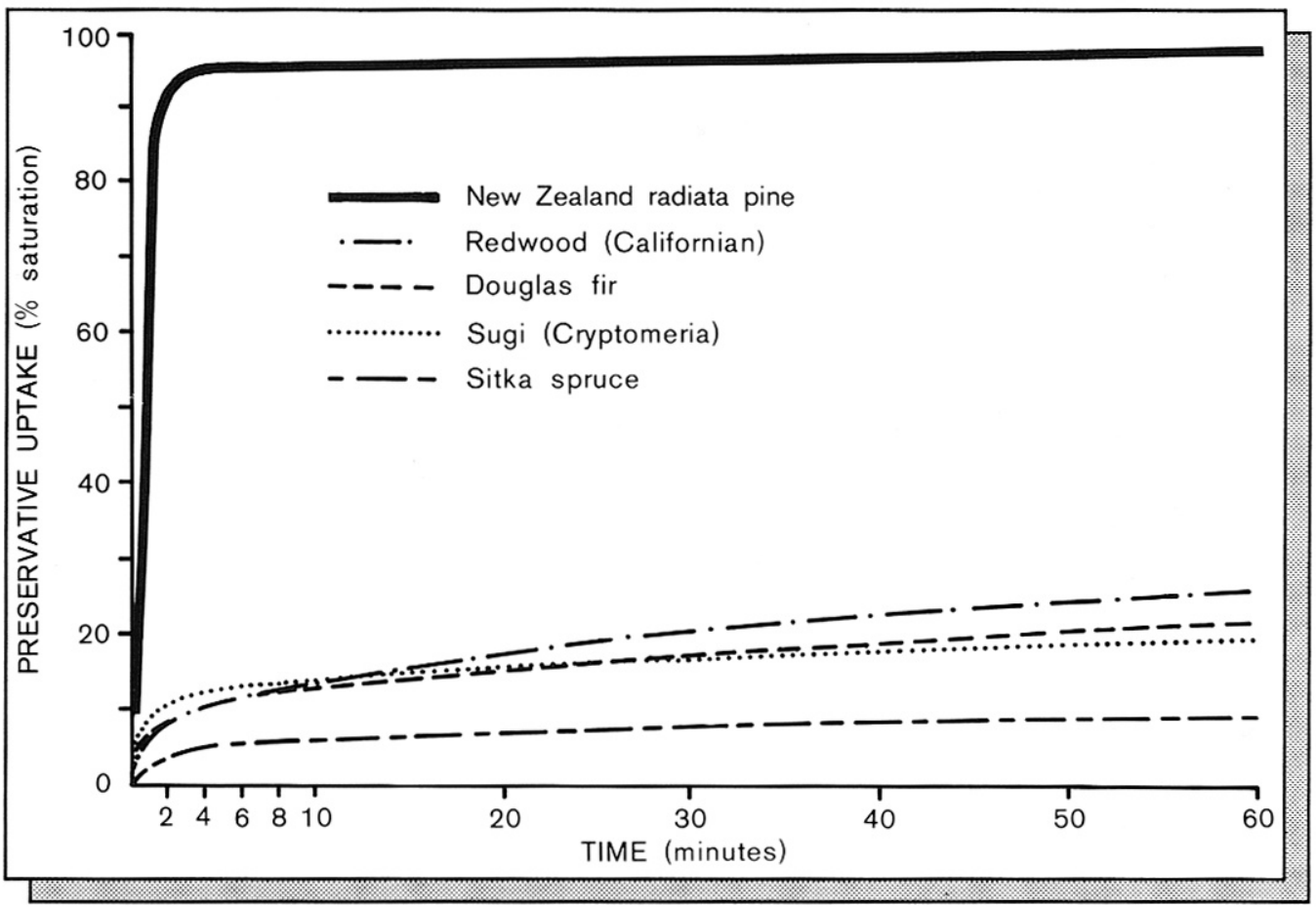

TABLE 13–*Typical uses of New Zealand radiata pine when preservative-treated to the appropriate hazard class specification*

Item	Hazard class	Item	Hazard class
*Battens, fence	3	*Piles, building foundation	5
*Beams, laminated	3	Piles, fresh water	4
Boat building lumber	4	Piles, marine	6
Boxing, concrete	4	Plates, wall	1
Compost bins	4	Plywood, internal linings, sarking, flooring	1
Containers, plants	4	Plywood, external cladding, bracing, decking	3
Cooling towers	5	Plywood, ground contact, sheathing, bins, races	4
*Crib walling, sawn	4	Plywood, ground contact, treated lumber frame foundations	5
Decking, bridge	4	Poles, barn	4
Decking, wharf	4	Poles, electrical transmission	5
Fascia board	3	Poles, horticultural (severe sites)	5
Finishing lumber, exterior	3	Poles, houses	5
Finishing lumber, interior	1	Poles, telecommunication	5
Fire escapes	4	Posts, guardrail	4
Flooring	1	Posts, horticultural (severe sites)	5
Formwork, concrete	4	Posts, round, half-round, sawn	4
Framing, house	1	*Posts, sawn, for domestic fencing	4
Furniture, garden	3 or 4	Purlins	1
Gates	3	Rails, fence	3
Glasshouse lumber	3 or 4	Rails, stockyard	3 or 4
Horticultural sawn lumber (severe sites)	5	Railway sleepers (cross ties)	4
Joinery, interior	1	Sarking	1
Joinery, exterior	3	Seed boxes	4
Joists, ceiling	1	Shingles, roof	3
Joists, floor	1	Slipways (marine)	6
Marine lumber, i.e., fixed in sea water	6	†Spa pools	4
Mushroom boxes	4	Studs	1
Oyster farming lumber	6	Sundecks	3
*Palings, fence	3	Trusses, roof	1
Patio decks	3	Turnery	1
Pergolas	3 or 4	Verandah floors	3
*Pickets, fence	3	Weatherboards	1 or 3
		Wet process factories	4

* Treated in final shape and form

† Selected sapwood only

SUMMARY OF HAZARD CLASS DESCRIPTIONS APPLICABLE IN AUSTRALIA AND NEW ZEALAND

Hazard Class H1: Where lumber, including plywood, is used out of contact with the ground and in situations which are adequately ventilated and continuously and completely protected from the weather by roofs and exterior wall coverings. The primary risk to the lumber is attack by wood-boring beetles such as *Anobium* or *Lyctus*.

Hazard Class H2: Where lumber is protected from the weather but may be subjected to intermittent wetting (low decay hazard) and/or to termite attack (applicable in Australia).

Hazard Class H3: Where lumber may be exposed to the weather or is used as exterior covering and exterior joinery of buildings, but will not be in contact with the ground (moderate decay hazard).

Hazard Class H4: Where lumber is used in contact with the ground, or in fresh water, or in other situations favourable to decay. Very severe environments such as some horticultural sites constitute a higher Hazard Class (H5) which should also be used for critical end-uses such as lumber for building foundations.

Hazard Class H5: Where lumber is used in contact with ground that because of climate, soil, or other factors presents an extreme decay hazard, or where the commodity is a critical use requiring additional protection.

Hazard Class H6: Where lumber is subjected to prolonged immersion in sea water.