
▲ PERFORMANCE OF NEW ZEALAND RADIATA PINE UNDER LOCAL CONDITIONS

New Zealand radiata pine has been used for many constructional, engineering, and decorative uses for more than 40 years in New Zealand. Most of this lumber has been preservative treated, and trials to monitor performance of a range of commodities under all types of exposure conditions have been established over the past 30 years by the Forest Research Institute of the New Zealand Ministry of Forestry (Table 18). The final chapter of this booklet details some of these trials as examples of performance of New Zealand radiata pine in service.

Roundwood

Posts: Small-diameter, treated roundwood is used extensively in agriculture, horticulture, and landscaping. Tests have indicated that posts treated to 12 kg/m³ with CCA will have minimum average lives of 40 years in most situations, but in highly fertile soils which are found in many horticultural sites retentions of 16 kg/m³ are required for long-term durability.

Poles: Telephone poles treated to 12 kg/m³ with CCA — only 75% of currently required retentions — have been in test for 26 years. During that time there has been no significant deterioration and average service lives are expected to be at least 50 years. Average lives of poles treated to the current specification of 16 kg/m³ CCA are expected to be well in excess of this figure.

A high proportion of domestic building utilises pole frame, pole platform, or driven pile construction techniques. Specifications for preservative treatment of house foundations are more stringent than for line poles and the estimate for average service lives of such material is at least 80 years.

Marine piles: In service tests no failures have occurred after 20 years of sea water exposure in New Zealand radiata pine marine piles treated with CCA to 16 kg/m³, although redistribution of preservative components within piles and eventual loss to the sea have been detected after prolonged

sea water exposure. To counteract this, piles are now treated to retentions of 27 kg/m³ but no estimate can yet be made on the effect this will have on extension of service life.

Sawn lumber

Railway sleepers: Service tests established 30 years ago demonstrated that New Zealand radiata pine had sufficient mechanical strength for utilisation as railway sleepers (cross-ties). Normal practice has been to treat with 60:40 creosote:fuel oil or 5% PCP+oil to retentions of 96 or 128 kg/m³ by the Rueping process. Since standardisation of treatment procedures in the early 1960s, failures through decay, mechanical wear, or splitting have been exceedingly rare.

Bridges: Road, railway, and pedestrian bridges constructed from glue-laminated stringers or arches, with nail-laminated decks of New Zealand radiata pine are under test. Preservative treatment has been with CCA to 12 kg/m³ or 5% PCP+oil to 128 kg/m³. No decay has been detected in any bridge during the 20 years that tests have been established. Slight delamination has been observed on CCA-treated glue-laminated stringers but this has had no visible effect on load-bearing capacity.

Building components

All building components which can be manufactured from lumber have been fabricated from New Zealand radiata pine and placed under test. Trials have been established with several preservatives in domestic and commercial constructions and include foundations (CCA), flooring (boron), framing (boron, CCA), joinery (boron, CCA), exterior cladding (boron, CCA, TBTO), and roofing shingles (CCA, Cu naphthenate). Glue-laminated beams (CCA), arches (CCA), and plywood (Cu naphthenate) are also under test. Trials have been established at various times since 1967 and no failures of any components either through decay, insect attack, or mechanical weakness have been recorded.

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Geothermal steam bore silencers

A unique example of the versatility of New Zealand radiata pine can be seen at the Wairakei Geothermal Power Station. New Zealand radiata pine was for many years the preferred material for constructing twin cyclone silencers at the head of each bore where steam (ducted under pressure to the

power house for electricity generation) is separated from water vapour which is vented to the atmosphere through the silencers. Service tests demonstrated that the average life of pine silencers treated with 5% PCP+oil to 128 kg/m³ was 12 years compared with 1.5–2 years for reinforced-concrete silencers.

TABLE 18—Service test projects initiated by the Forest Research Institute, New Zealand

Commodity	Total number of test projects	Number of New Zealand radiata pine projects	Number of New Zealand radiata pine units per commodity	Date earliest project establ.	Preservatives in test
Railway sleepers	12	9	2233	1958	CCA, creosote, PCP+oil
Transmission poles	44	9	145	1964	CCA
Marine and freshwater piles	11	6	275	1964	CCA
Fence posts	17	4	470	1961	CCA, Creosote, PCP+oil, Cr/As, F/Cr/As/Phenol
Building components	28	16	16*	1959	CCA, Boron, Dieldrin, Cu naphthenate/TBTO
Bridges	17	16	16†	1957	PCP+oil, creosote, CCA, CZCA
Geothermal bore silencers	1	1	10	1965	PCP+oil

* Number of buildings containing tests
 † Number of bridges under test

ABBREVIATIONS USED FOR PRESERVATIVES IN THIS BOOKLET

CCA	copper-chrome-arsenate
PCP+oil	5% pentachlorophenol + fuel oil
Cr/As	chrome-arsenate
F/Cr/As/Phenol	fluor-chrome-arsenate phenol
Cu naphthenate	copper naphthenate
TBTO	bis (tri-n-butyltin) oxide
CZCA	copper-chrome-zinc-arsenate
Boron	boric acid / sodium octoborate