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Appendix 2

Table 1. Background levels of Cu, Cr and As in Australian soils

element	ppm
Cu	1-190
Cr	0.5-17
As	0.2-8

Appendix 3

Table 2. Background levels of Cu, Cr and As, in fresh and salt water (USA data).

element	ppm fresh	ppm marine
Cu	0.005	0.002
Cr	0.012	0.003
As	0.05	0.001

Note: Springs in the Waiotapu Valley, North Island, New Zealand have been recorded with up to 26,000 ppm naturally occurring arsenic. (Grimmett and McIntosh, 1939)

Appendix 4

Table 3. Background levels of Cu, Cr and As in sediments (USA data).

element	ppm
Cu	10-30
Cr	52
As	10

Note: Waiotapu Valley sediments have been recorded with up to 19,000 ppm naturally occurring arsenic. (Grimmett and McIntosh, 1939)

Appendix 5

Table 4. Proposed soil (Agricultural/Horticultural) and water (Potable) maximum permissible Guideline Values for Copper, Chromium (Cr NO) and Arsenic (Source: Boyd, 1995)

Element	soil (mg/kg)	water (mg/L)
Cu	30-100	1.0
Cr	10	0.06
As	10	0.012

Appendix 6

Table 5. Levels of Cu, Cr and As found in sand adjacent to CCA-treated timber.

Sampling zone	range Cu ppm	range Cr ppm	range As ppm	Average total Cu	Cr	As
surface near timber	9.5 - 13.4	5.3 - 7.0	0.7 - 9.2	11.2	6.1	5.2
surface 0.5 m from timber	7.6 - 10.8	3.3 - 6.3	0.5 - 1.7	9.7	5.4	0.7
0.2 m down near timber	7.9 - 11.9	3.4 - 9.3	1.3 - 12.9	10.5	6.2	4.2
0.2 m down 0.5 m from timber	6.8 - 10.6	3.7 - 6.9	0.3 - 0.9	9.8	5.5	0.6

Appendix 7

Table 6. Criteria (years to failure) for natural durability classification.

Specimen size	Perishable	Non-durable	Moderately Durable	Durable	Very Durable
20 x 20 mm	< 2.5 years	2.6 - 5 years	5.1 - 7.5 years	7.6 - 12.5 years	> 12.5 years
50 x 50 mm	< 5 years	6 -10 years	11-15 years	16 -25 years	> 25 years

Appendix 8

Table 7. Natural durability of indigenous and exotic species tested by NZ FRI.

Perishable	Non-durable	Moderately Durable	Durable	Very Durable
Hardwoods				
Tawa Silver birch	Hinau Mangeao Pukatea *Euc. regnans* * *Euc. viminalis* Silver beech	Black beech *Euc. globulus* *Euc. radiata* *Euc. sieberi*	Hard beech Mountain beech Red beech Southern rata *Euc. amygdolina* *Euc. botryoides* *Euc. globoidea* *Euc. muellerana* *Euc. obliqua* *Euc. pilularis* *Euc. saligna* *Euc. microcorys*	Robinia *Euc. cladocalyx* *Euc. cornuta*
Softwoods				
Corsican pine Ponderosa pine Douglas fir	Miro Matai Kauri Muricata pine Radiata pine Strobus pine Lodgepole pine Western red cedar	Kaikawaka Tanekaha Rimu Macrocarpa Lusitanica Lawson's cypress		Silver pine Totara

* *Euc.* = *Eucalyptus*

Appendix 9

Table 8. Inter-tree variability in natural durability of three Eucalyptus species.

Species	Number of specimens remaining (and average life)				
	Tree 1	Tree 2	Tree 3	Tree 4	Tree 5
E. pilularis	5	0 (av. life 7 yr)	3	0 (av. life 5.7 yr)	2
E. muellerana	2	1	2	1	0 (av. life 8 yr)
E. globoidea	4	6	2	0 (av. life 4 yr)	1

Appendix 10

Table 9. Natural durability service tests of various commodities.

Species/Commodity	years in test	No. in tests	% soundness	(number failed)	Comment
Fence posts					
Macrocarpa	26	25	6	(21)	severe decay
E. botryoides	26	37	41	(11)	poor condition
E. muellerana	26	33	23	(21)	poor condition
E. saligna	26	33	54	(7)	fair condition
Robinia	26	24	38	(10)	poor condition
H4 treated radiata pine	26	35	94	(0)	excellent condition
Fence battens					
Macrocarpa	26	99	51		fair condition
E. botryoides	26	98	71		fairly good
E. muellerana	26	96	67		fairly good
E. saligna	26	120	68		fairly good
E. obliqua	26	117	64		fairly good
E. pilularis	26	112	73		good condition
H3 treated radiata pine	26	96	96		excellent condition
Decking					
Macrocarpa	8	10	74	(1)	minor decay at bearers
E. botryoides	8	10	78		minor decay
E. botryoides	12	15	82		severe decay in some boards
E. muellerana	8	10	73		minor surface decay
E. saligna	8	11	79		minor decay at bearers
E. saligna	12	15	82		severe decay in some boards
E. saligna	13	30	83		severe decay in some boards
E. obliqua	8	10	73		minor decay
H3 treated radiata pine	5	10	100		completely sound

Appendix 11

Table 10. Costs of NZ-grown and imported naturally durable timbers.

Species	Grade	NZ$ per m³ ex-Auckland		
		Dimensions (mm)		
		150x25	100x40	100x50
kwila	clear, heart	2045	2045	2045
balau	clear, heart	1880	1880	1880
saligna	clear, heart	1740	2020	2300
botryoides	clear, heart	1740	2020	2300
pilularis	clear, heart	2460	2330	2530
obliqua	clear, heart	2200	2450	2800
macrocarpa	clear, heart	1250	1240	1240
lusitanica	clear, heart	1250	1240	1240
pilularis	structural	1200	1200	1200
macrocarpa	structural	645	660	660
lusitanica	structural	645	660	660
H3 treated pine	structural	645	660	645
saligna	DRS/Merch *	1200	1200	1200
botryoides	DRS/Merch	1200	1200	1200
macrocarpa	DRS/Merch	540	530	530
lusitanica	DRS/Merch	540	530	530
H3 treated pine	DRS/Merch	540	530	530

* dry rough sawn/merchantable

Appendix 12

Table 11. Area of New Zealand forest planted with durable eucalypts.

Species	Age Class			Total area (ha)
	10 years and under (ha)	11-29 years (ha)	30 years and over (ha)	
E. botryoides	13	141	8	162
E. saligna	910	353	88	1351
E. muellerana	6	0	3	9
E. pilularis	5	5	5	15
Total	**934**	**499**	**104**	**1437**

Appendix 13

Table 12. Relative performance of multi-salt formulations after 16 years' exposure at 5 test sites in New Zealand

Formulation	Retention kg TAE/m³	% soundness (number of failures in parenthesis)				
		Site 1 Glenbervie	Site 2 Whaka	Site 3 Waitarere	Site 4 Hanmer	Site 5 Harl Harl
CCA salt	6.20	79 (0)	100 (0)	89 (0)	100 (0)	75 (0)
	4.51	72 (0)	84 (0)	70 (0)	100 (0)	70 (0)
	3.25	61 (0)	74 (0)	70 (0)	91 (0)	72 (0)
	2.44	49 (2)	67 (0)	67 (0)	69 (1)	67 (0)
CCP	6.2	72 (0)	90 (0)	74 (2)	57 (4)	76 (0)
	4.4	73 (0)	90 (0)	74 (1)	89 (1)	76 (0)
	3.1	63 (1)	91 (0)	63 (1)	59 (4)	70 (0)
	2.4	60 (1)	56 (2)	28 (7)	47 (4)	67 (0)
CCF	6.1	78 (0)	83 (0)	76 (0)	83 (0)	75 (0)
	4.7	77 (0)	83 (0)	66 (1)	68 (1)	72 (0)
	3.4	63 (1)	65 (1)	51 (3)	53 (3)	70 (0)
	2.5	46 (3)	60 (1)	49 (3)	43 (5)	70 (0)
CCB	6.52	83 (0)	97 (0)	62 (3)	80 (2)	93 (0)
	4.62	72 (0)	94 (0)	37 (6)	47 (5)	78 (0)
	3.35	72 (0)	74 (1)	28 (6)	57 (4)	72 (0)
	2.45	67 (0)	74 (0)	35 (4)	56 (4)	72 (0)

In the above table: 100 = completely sound, no decay
90 = suspicion of decay
70 = moderate decay
40 = severe decay
0 = failure through decay

Appendix 14

Table 13. Laboratory leaching test (El 1-87) ACQ Type B and CCA Type C at 6.4 kg/m³ actives.

Formulation	% leached			
	CuO	DDAC	CrO_3	As_2O_5
ACQ Type B	14.7	3.27		
CCA Type C	2.4		0.36	9.45