VENEER YIELDS OF NEW ZEALAND-GROWN SLASH PINE

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ABSTRACT

Slash pine (**Pinus elliottii** Englm.) grown in New Zealand is suitable for veneer production, despite the presence of a wide juvenile core of low density, and higher resin content than other pines grown in New Zealand. The green veneer yield was 55.5% of bolt volume, but the yield of A and B veneers was usually low because of the presence of a wide knotty core in late- or unpruned bolts. There was no appreciable degrade after drying, except for end splitting which could be overcome by using a milder drying schedule.

INTRODUCTION

Slash pine has been planted in northern New Zealand since the 1930s, and stands totalling 2 080 ha comprise 60% of the area in southern pines. The other major species are loblolly pine (*Pinus taeda* L.) and longleaf pine (*Pinus palustris* Mill.). Various U.D.D. studies have shown the stiffness property of slash pine to be about 25% below that of radiata pine (*Pinus radiata* D. Don) grown in central North Island, the material which would normally be marketed. As a result, slash pine was excluded from the revised New Zealand National Timber Grading Rules for timber suitable for framing or structural purposes.

An alternative outlet may be for the production of veneer from logs suitable for peeling. This paper covers trials of this aspect of utilisation.

MATERIAL AND METHODS

Test Material

A sample of 40 peeler logs totalling 20 m^3 was obtained from a mature stand, established in 1935, in Waipoua Forest. The stand was low-pruned to 2.5 m and high-pruned to 5 m at ages 10 and 20 respectively, and thinned to 200 stems/ha between age 26 and 30. The sample included logs from unpruned trees, which had been left at thinning because of their size. The logs had length 5.2 m and minimum small-end diameter of 380 mm. They were debarked, cross-cut into two bolts of equal length, and end diameters measured. The bolts were then held at 39-41° for 20 h in the log pre-conditioning tank.

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Peeling

The heated bolts were peeled on a Wartsila 2640-mm rotary lathe to give 3-mm (nominal) veneers. The horizontal gap setting was about 90% of the veneer thickness. The knife angle was 91° and sharpness angle 20° 30'. Peeling speed was 1.08 m/s.

The diameters of bolt after initial rounding off, and of core after peeling, were measured. Veneer sheets were separately identified, and factors affecting veneer yield (type of defects, distribution of knots, size of knotty core) were noted for each bolt.

Drying

The veneers were filletted and dried in a McDonald conventional kiln to 6-8% moisture content. The temperature of 93° was reached in 5 h and maintained for the remaining 5 h.

Grading

Dry veneers were graded into five categories: Grades A, B, C, D and below grade (Standards Association of New Zealand, 1971). Although patching and plugging are permissible in all grades, no attempt was made in the study to record possible grade improvement by patching. The percentage grade recoveries for each bolt and the overall recovery of each grade were calculated.

Yield and Wood Loss Calculation

The gross volume of each debarked bolt was calculated using the Newton's formula as shown below.

$$V = \frac{\pi L}{12 \times 10^4} (D^2_S + D_S D_l + D^2_l)$$

Where V is the gross volume in cubic metre,
D_S is the small-end diameter in centimetre,
D_l is the large-end diameter in centimetre,
and L is the bolt length in metre.

Roundup bolt and core volumes were calculated using the standard cylinder volume formula.

For each bolt:

Roundup loss = Gross volume — Roundup volume

$$\text{Trim loss} = \frac{\pi l}{4 \times 10^4} (D^2_r - D^2_c)$$

where D_r = diameter (cm) of the roundup bolt
D_c = diameter (cm) of the core
l = trim length (m)

Green-end clipper loss = Roundup volume — Recovery — Core — Trim loss.

RESULTS AND DISCUSSION

Suitability for Peeling

Forty veneer bolts were peeled; 39 successfully and 1 spun out when the outer chucks were removed.

The lower overall density of slash pine veneer bolts (mean basic density : 351 kg/m^3)

as compared to radiata pine (417 kg/m^3), and of the corewood in particular, did not present any problem in peeling. It has been reported by some plywood manufacturers in New Zealand that low density is the main cause of spin-out in peeling radiata pine veneer bolts. This study showed that this is not necessarily the case. Lutz (1974) attributed spin-out to overheated bolts whose ends have less holding power than bolts heated to a lesser extent.

The sapwood resin content of about 4% in slash pine is a little higher than most New Zealand-grown *Pinus* species and the heartwood resin content averages about 10% (Birt, 1974). The high resin content of slash pine might cause peeling problems (by accumulating on the pressure bar and possibly dulling the knife more quickly) but most of the resin in the bolts seemed to have exuded before and during preheating. Furthermore, very little heartwood veneer was produced. Birt (1974) reported that the heartwood content of slash pine grown in New Zealand generally accounts for less than 10% of volume of the merchantable stem. As the veneer bolts were peeled down to 180 mm core diameter, most of the heartwood in them was left behind as core which averaged about 15% of the bolt volume in this study (Table 1).

TABLE 1—Distribution of slash pine veneer bolts by diameter class; recovery and residue components as percentage of total bolt volume

Small End Diameter (mm)	Number of Bolts	Total Volume (m^3)	Green Volume Recovery (%)	Residue Components (%)			
				Core	Round-up Loss	Green-end Clipper Loss	Spur Trim Loss
400	4	1.3723	50.8	19.9	11.9	16.1	1.3
420	6	2.2685	52.6	18.9	11.0	16.1	1.3
440	4	1.6797	55.3	16.5	9.2	17.6	1.4
460	4	1.8097	57.5	15.6	10.7	14.8	1.3
480	5	2.5016	50.0	14.8	10.6	23.2	1.4
500	4	2.0688	58.2	13.0	8.7	18.7	1.3
520	3	1.7548	60.2	11.4	10.4	16.7	1.4
540	2	1.3329	50.7	9.9	15.0	23.0	1.3
560	2	1.2949	54.9	15.2	8.3	20.3	1.4
580	2	1.4691	62.5	9.9	10.4	15.8	1.3
620	1	0.8798	73.3	7.2	13.1	5.1	1.3
660	1	0.9840	59.8	7.4	12.4	19.1	1.3
700	1	1.1528	63.6	5.5	16.2	13.4	1.2
As percentage of bolt volume			55.5%	14.6%	11.0%	17.5%	1.3%

Drying Characteristics

No major drying effects were encountered in drying slash pine veneers to 6-8% moisture content except that more severe end splitting than is usual in radiata pine veneer caused many clear veneers to be downgraded. To minimise this drying defect, a milder schedule might be required to dry slash pine veneers. There was slight buckle around the knots and in heart veneers. Sap veneers dried satisfactorily. The dried veneers were handled without difficulty.

Before drying the slash pine veneers were highly susceptible to the development of mould and sapstain fungi, which may cause undesirable blemishes and spoil the appearance of clean or face veneers. Consequently, freshly-peeled slash pine veneers must be dried within 30 h after peeling.

Veneer Yields

The distribution of veneer bolts by diameter classes and their percentage of yield and wood loss are shown in Table 1. The yields from both the pruned and unpruned bolts were combined as it was determined (t-test) that there was no significant difference between the means of volume recovery (Table 2).

TABLE 2—Yields from pruned and unpruned bolts

Type of Bolts	No. of Bolts	Mean s.e.d.	Gross Yield	Significant Difference at 5% level
Pruned	23	480 mm	54.9%	Not significant
Unpruned	16	490 mm	57.2%	
All	39	480 mm	55.5%	

After drying, 5.8% of veneer was below grade (Table 3). By deducting a further loss of 3% through veneer shrinkage, the dry untrimmed veneer recovery was 46.7%. This yield was comparable with radiata pine in the same diameter class (Chong, unpubl.).

There was a poor association (R = 0.24) between percent recovery and diameter class. In some diameter classes large bark encased knots were responsible for excessive

TABLE 3—Grade recoveries from pruned and unpruned bolts

Type of Bolts	No. of Bolts	Mean s.e.d. (mm)	Grade Recovery (%)				
			A	B	C	D	Below Grade
Pruned	23	480	6.6	23.4	30.6	34.4	4.8
Unpruned	16	490	—	0.6	26.2	66.2	7.0
All	39	480	3.9	14.0	28.8	47.5	5.8

green-end clipping with a consequent loss of yield (cf. Table 1 — lower green volume recoveries are generally associated with higher green-end clipping losses).

Another explanatory variable which could affect yield was degree of taper. The multiple regression for predicted yield on both diameter class and degree of taper was significant at the 0.01 level.

Grade Recoveries

As pruning was late, the amount of clean A and B grade veneer produced (Table 3) did not truly reflect the yield possible from trees pruned at an earlier age. Sutton (1972) has demonstrated the importance of timely pruning if optimum clearwood production is to be achieved. In a study of timely pruned radiata pine veneer bolts of similar diameter classes, 31% of A grade veneer was obtained (Chong and Gibson, 1977), approximately a five-fold difference.

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